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ABSTRACT

This symposium explored the effects of computers and modern technologies on library automation and cooperation. The following presentations are included in this collection: (1) "Economic Squeeze and Technological Challenge--Swedish Library Automation, 1987-90" (Svante Hallgren); (2) "A European Bibliographic Database Centre" (Bernard Gallivan); (3) "University Faculty Use of Computers and Bibliographic Searching" (Andrew G. Torok); (4) "OSI-Application Protocols" (Liv A. Holm); (5) "The U.S. National Standard Command Language for Online Interactive Information Retrieval: A Status Report" (Charles R. Hildreth); (6) "Problems, Issues, and Prospects in the International Electronic Exchange of Alpha-Numeric, Pictorial, and Graphic Educational Information Resources" (H. J. Abraham Goodman and Oldrich Standera); (7) "Test Run of a Network of Library and Information Systems" (Katarzyna de Brisis); (8) "Interactive Display of Text and Graphics on an IBM PC" (Thomas B. Hickey and John C. Handley); (9) "CD-ROM and Public Access Catalogues: Uses, Advantages, Problems" (Charles R. Hildreth); (10) "Optical Disc Pilot Program at the Library of Congress" (Joseph W. Price); (11) "The Potential of the Interactive Videodisc for International Cooperation as Documented by Project Emperor-I" (Ching-chih Chen); (12) "ALIS--The Online Public Access Union Catalogue and Document Ordering System of the Scandinavian Central Libraries of Technology" (Bent Barnholdt); (13) "Current and Future Forms of Information Retrieval as Provided by University Microfilms International" (Susan Orchard); and (14) "Linking Supra-Local Demands with Local Demands in the Individual Library's EDP Planning" (Hans-Albrecht Koch). The papers are supplemented by figures and photographs, and many contain either bibliographic references or bibliographies. Three additional papers were presented: "Distributing Data on Micros: Floppies, CD-ROMS and/or Online" (Kate Bivens Noerr and Peter Noerr); "CD-ROM and Electronic Publishing" (Ulrich Schwerhoff); and "VISCOUNT: An Electronic Network for Interlibrary Loans" (Peter Smith). (EW)

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Impact of New Information Technology on International Library Cooperation

Edited by

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Joachim W. Weiss

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Workshop zur Benutzerschulung
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Impact of New Information Technology on International Library Cooperation

Essen Symposium
8 September - 11 September 1986

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Hans-Albrecht Koch · Joseph W. Price ·
Andrew G. Torok · Susan Orchard ·

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Ahmed H. Helal
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Essen Symposium 1986
Essen University Library

Impact of New Information Technology on International Library Cooperation

8 September – 11 September
1986

Preface

The 9th International Essen Symposium on library automation and evaluation of new technological developments was held in Essen University Library, September 8 — September 11, 1986. The international Essen Symposium is an annual meeting, taking place in autumn, with a limited number of participants by invitation. The 1986 Symposium had the topic "Impact of new information technology on international library cooperation".

This symposium provided an opportunity for experts to share ideas, research findings, experiences, standards, and procedures for practical application of computers and modern techniques in libraries and how it can be improved and advanced. It served as communication vehicle for the interchange of information and thoughts. In addition, vendors demonstrated their hardware, software, courseware, and literature related to computer-based applications, a forum for the exchange of ideas among users and developers of computer systems for libraries.

The symposium was attended by internationally known speakers covering the following topics: effects of budget deficit and economic squeeze on libraries; optimal use of big centralized systems by retaining local independence; problems of linking more library systems for achieving a higher coverage of data; possible cooperation across national boundaries; cooperation among the Scandinavian central libraries of technology and the impact of ALIS; possibility of setting up an European Bibliographic Centre which would be more efficient and cost effective; use of online bibliographic databases and information seeking behaviour; distribution of data on various storage media and distribution of functions across hardware; OSI applications protocols and the importance of a standard for an application protocol for library and information systems (ISO TC 46); the differences and similarities between LSP and BIBNETT application protocol; standards in the sense of specifying the vocabulary, syntax and operational of commands in an easy to learn and easy to use common language for online interactive retrieval systems; international electronic exchanges of information resources even in the absence of the de facto standard command language among the more than 300 online retrieval interfaces in use today; linking library systems on mainframes and microcomputers for housekeeping functions; bibliographic search and bibliographic data transfer; CD-ROM technology and their use in OPACs and information retrieval systems; problems and advantage of displaying documents stored on CD-ROM on current personal computer displays; problems of integrating the new optical systems with existing automated library systems.

The attraction of the 9th International Essen Symposium was the display of the latest technological wonder "The potential of interactive videodisc for international cooperation as documented by project EMPEROR-I of China", demonstrated by Prof. Dr. Ching-chih Chen. The interactive videodisc opens a new area in research and applications of computer-controlled, multimedia, audiovisual teaching and research environment.

As in previous years the discussions were in-depth, informative, and thought-provoking. Thanks to all speakers and participants who made the symposium - as in previous years - a great success and giving it the international reputation.

Essen, November 1986

A. H. Helal
J. W. Weiss

Essen Symposium 1986
Essen University Library

Impact of New Information Technology on International Library Cooperation

8 September – 11 September
1986

Agenda

MONDAY, SEPTEMBER 8

9.30 Registration

10.15 Online presentations: all about "Sandra": A first presentation of the Sandra" software package for Beilstein handbook users

GERTRAUD GRIEPKE

13.45 OPENING OF SYMPOSIUM

AHMED H. HELAL

FRITZ STEIMLE
(President of Essen University)

Chairman: R. L. HUNSUCKER

14.00 Economic squeeze and technological challenge -
Swedish library automation 1987-1990

SVANTE HALLGREN

14.30 A European bibliographic database centre

BERNARD GALLIVAN

15.00 Discussion
Coffee

15.30 University faculty use of computers for bibliographic searching

ANDREW G. TOROK

16.15 Discussion

16.45 Online presentations

19.00 Reception

TUESDAY, SEPTEMBER 9

Chairman: L. COSTERS

9.30 Distributing data on micros:
floppies, CD-ROMs, and/or online

KATE BIVINS NOERR

PETER NOERR

10.00 OSI-application protocols

LIV A. HOLM

10.30 Discussion
Coffee

11.00 The U.S. National Standard Command Language
for online, interactive information retrieval:
A status report

CHARLES R. HILDRETH

11.45 Discussion

Chairman: A. J. KARMIGGELT

14.00 Problems, issues, and prospects in the international electronic exchange of alpha-numeric, pictorial, and graphic educational information resources

H. J. ABRAHAM GOODMAN
OLDRICH STANDERA

14.30 Test run of a network of library- and information systems

KATARZYNA DE BRISIS

15.00 Discussion
Coffee

16.15 Discussion

16.45 Online presentations

19.00 Reception

WEDNESDAY, SEPTEMBER 10

Chairman: G. GATTERMANN

9.30 Interactive display of text and graphics on an IBM PC

THOMAS B. HICKEY
JOHN C. HANDLEY

10.00 CD-ROM and "Electronic Publishing"

ULRICH SCHWERHOFF

10.45 Discussion
Coffee

11.15 CD-ROM public access library catalogues:
uses, advantages, problems

CHARLES R. HILDRETH

11.45 Optical disc pilot program
at the Library of Congress

JOSEPH W. PRICE

12.15 Discussion

Chairman: A. H. HELAL

14.00 The potential of the interactive videodisc for international cooperation as documented by project Emperor-I
Demonstrations

CHING-CHIH CHEN

16.00 Online presentations

19.30 Reception

THURSDAY, SEPTEMBER 11

Chairman: S. HUNSTAD

9.30	ALIS - the online public access union catalogue and document ordering system of the Scandinavian central libraries of technology BENT BARNHOLDT
10.00	VISCOUNT: an electronic network for interlibrary loans PETER SMITH
10.30	Discussion Coffee
11.00	Current and future forms of information retrieval as provided by University Microfilms International SUSAN ORCHARD
11.30	Linking supra - local demands with local demands in the individual library's EDP planning HANS-ALBRECHT KOCH
12.00	Discussion
12.15	Summing-up CHING-CHIH CHEN
13.00	CLOSE OF SYMPOSIUM

Essen Symposium 1986
Essen University Library

Impact of New Information Technology on International Library Cooperation

8 September – 11 September
1986

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Essen Symposium 1986
Essen University Library

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Economic Squeeze and Technological Challenge
- Swedish Library Automation 1987-90

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Economic Squeeze and Technological Challenge
- Swedish Library Automation 1987-90

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The economic forecasts for Sweden as a nation are reasonably bright but even so libraries are facing increasingly difficult times. The Swedish taxes are among the highest in the world and the public sector of economy comprises more than 50% of the GNP. This and a budget deficit that has been a growing governmental headache for the last ten years has resulted in harsh saving programs at both governmental and local levels that don't spare libraries and budgets are often cut or frozen at zero growth.

The effects on library automation plans are interesting and not entirely discouraging since many libraries now seem to look upon automation as the best tool for efficiency increases and (eventually) staff cuts. This mirrors the development of the central bibliographic systems BUMS (public libraries) and LIBRIS (research libraries), two reasonably mature networks now considered indispensable by the libraries.The perpetual discussion about pros and cons of local systems has changed somewhat during the last year as network-enthusiasts in the municipal administration have begun to define local systems as local municipal systems (i.e. local nets) comprising also the library routines. And the National Office for Administrative Rationalization and Economy (Statskontoret) strongly recommends governmental agencies to buy only EDP systems offering UNIX:

The libraries must try to find an optimal way of using the big centralized systems while at the same time retaining their necessary independence but they also have to concede to requests from municipal authorities to stay in line (and preferably on-line) with the over-all municipal EDP policy - whatever that may be. Traditional turn-key library systems obviously have to make considerable adjustments if they are to fit into this emerging picture.

Certain changes in the strategies and (price) policies adopted by the central system can be expected. And interesting new uses of computer/telecommunication technology will continue the ongoing process of changing library routines beyond recognition[1]. Eventually they will change the very idea of libraries and their role in society whatever the future of the precious printed book may be.

The writing on the screen is already there for everyone to see.

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[1] The use of catalogue cards is declining and few tears would be shed if the demise of the fiche catalogue were to be announced. But will it be replaced by a central/local network or by a standalone CD-player in every branch library and book-mobile?

Economic Squeeze and Technological Challenge
- Swedish Library Automation 1987-90

I will try to predict the course and speed of Swedish library automation for the next 3-5 years. That, one might think, should not be too exacting a task, given the relatively slow pace of automation progress in Swedish libraries during the past 15 years. In the present situation there are some factors however that might lead to important changes both in the overall concept of library automation and in the automation efforts at individual libraries.

Before I make an attempt at crystal-ball gazing I will give you a few background facts:

Sweden's population: 8.500.000
Local authorities: 284
Counties: 24
Taxation: High! Progressive. Average personal taxation 40%. VAT 23%.

The public sector of economy accounts for more than 50% of GNP!

University- and Research Libraries

Shared cataloguing system: State owned and sponsored LIBRIS with state owned (IBM-)computer center DAFA as host. LIBRIS uses DAFA:s dedicated network with five multiplexors, strategically placed throughout the country to reduce telecommunication costs to a minimum.

Participating libraries: 24
Terminals: 400
TTY connected libraries: 370
Number of transactions in online system: 6.483.000

Records in database: 1.460.000

Stand-alone systems:

Stockholm university: GEAC (operating)
Ultuna Agricultural University: RC (under implementation)

Request for Proposals:

Lund University
Gothenburg University

A model "Request For Proposal" will be presented by the prestigious National Office for Administrative Rationalization and Economy (Statskontoret) before the end of the year. This institution is known to recommend UNIX as the one and only operative system in multi user environments, and there is every reason to believe that this recommendation will prevail also in the library RFP. The impact of this recommendation on middle sized and small state owned libraries is likely to be considerable, and its effects will no doubt be noticeable also in the local authority sphere responsible for the public- and school libraries.

Public libraries

Public libraries are not prescribed by law but exist in all municipalities. The standard varies, but in international comparison the Swedish public libraries look reasonably adequate. They all use the Swedish version of AACR2 and the SAB classification system. Key factors in establishing and maintaining this uniformity are the services offered by the bibliographic utility Bibliotekstjänst (btj) - a shareholding company owned by the Library Association and the Union of Local Authorities. Bibliotekstjänst has developed the BUMS automation system comprising circulation control and catalogue modules. The catalogue module derives important synergetic advantages from the integration with the all-embracing (as far as Swedish literature is concerned) centralized reviewing and binding service offered by btj.

Libraries are connected to the central database BURK via leased lines (synchronous IBM 3270) or dial-up lines. IBM synchronous 3780 protocol takes care of the transfer of circulation control transactions. Asynchronous TTY or VT100 protocols are used for direct dial-up (or dial-up through the packet switching network DATAPAK) catalogue searching, patron and circulation information, barcode label ordering and local amendments to bibliographic records.

The BUMS system 1986:

Participating municipalities: 78
Others: 7
Libraries with circulation control: 156
Libraries with fiche catalogues: 997
Title records in database: 1.000.000
Title holdings information: 5.030.000
Copy specific holdings information: 12.000.000
Loan transactions: 15.000.000

Around 40% of the population in Sweden are served by public libraries with fiche catalogues and 20% of all library loan transactions in the country are registered in the BUMS system.

Stand-alone systems:

Stockholm public library will begin tests with DOBIS-LIBIS running on an IBM computer, operated by the municipality computer center.

Halmstad country library is interested in testing the RC-system.

The government agency Kulturraadet has given a modest grant to the Skellefteaa municipality to make tests with a UNIX-based PC-system named Peggi.
Peggi is also tested at Oerebro country library.

The perpetual squeeze

The first two words of the title of this paper are "Economic Squeeze". They refer to the increasing awareness that Swedish taxes have reached, and possibly exceeded, the highest tolerable level. The welfare state is rapidly becoming too expensive and drastic cuts are discussed while doctors, nurses, librarians and other public employees threaten to go on strike in order to end a frustrating wage deterioration.

The picture might be familiar to many in this audience but in Sweden this is something new. All official spokesmen declare of course that they do not question the welfare state - but they also know that the problems will not disappear unless they provide more money or cut down on service. And service cuts there are and library budgets are no exception. The favourite metaphor to describe the process a couple of years ago was "cheese slicer reductions". The Minister of Finance (social democrat) however, nowadays prefers talking of "power saw cuts" - especially in what he regards as spendthrift municipality budgets. This of course affects automation plans. Many libraries have realized that automation offers the only solution to long range savings while still retaining (and hope - fully improving) the present level of service. At the same time they have learned that transition from manual to computerized library routines is neither easy nor cheap. It might be tempting to put it off for some more years.

But few librarians and fewer library boards nowadays believe that it will be possible to hibernate through the economic freeze and resume spending as usual in a couple of years. Everybody agrees that the economic prospects for Sweden as a country are quite good at the moment, so "bad times" cannot excuse or explain the frequent, bloodthirsty cries for "power saw trimming of the public sector". The writing on the wall is reasonably clear however. It says: The affluence of the sixties will never return and the state debt acquired during ten consecutive years of severe budget deficits is more than enough. Now you must repay, repent and reorganize! And if power saw surgery is required - so be it.

Strange as it may sound, this is probably one of the explanations why the BUMS system has attracted so many new customers lately. Only a couple of years ago the conventional wisdom told that any library system worth its salt had to be a stand alone mini computer based system. Thus BUMS, heavily relying on centralized processing, must be out of date. Since then a number of libraries have paid professional consultants to appraise the various systems that could possibly be installed in Sweden. As a result now - nowadays most people seem to agree that the economic and sensible way for a public library to enter the automation club is by joining the BUMS-system. If and when this is to be followed by a conversion into a truly local system much of the heavy groundwork will already be done.

No one denies that conventional standalone systems in some cases are very good, but for most of the Swedish municipalities they are oversized and consequently too expensive. Foreign systems also have to learn to handle Swedish diacritics and Swedish classification and that does not make them cheaper.

Any system chosen by a Swedish public library would have to learn to handle records from Btj's database BURK. That,however, would probably not be a major obstacle since Btj has developed a conversion format much akin to OCLC's. Btj is also prepared to sell records to libraries using other systems than BUMS, on condition that the library does not give away or resell those records to other libraries or vendors.

And the BUMS system as it stands today is a good system that gives the library efficient computerized routines with a minimum of capital investments and staff training. And BUMS is an evolving system that does a lot of things today that it did not do a few years ago. It is also a system that promises to do a lot more in a couple of years.

The changing concept of local systems

The concept of the local system has also begun to change in more ways than one. A few years ago a local system in library lingo equalled a turn-key-system from GEAC, ALS or CLSI. When you talk to a Swedish public library today, you may well find that The Local System is described as a pattern where the library routines are envisaged as a small part of a unified EDP structure for the local municipality. UNIX may be considered a prerequisite or IBM compatibility one way or the other.

So far these systems are just a gleam in the eyes of planning committee members. It might be tempting for the library EDP-professional to shrug off the idea of such systems and to say something derisive about Management Information System concepts. We all remember that sensible people buried and forgot these dreams of "total" systems already in the seventies. I believe however that it would be a bad mistake to look upon the proposed municipality systems as stillborn descendants to the illfated MIS.

Since I am telling this to a non-Swedish audience I have to digress a little and emphasize the Swedish predilection for centralized systems and solutions. I have already mentioned that the municipalities are free to handle libraries as they choose, but that they nevertheless make them very uniform in order to benefit from central services like Bibliotekstjänst's. The same is true also for a lot of other municipal services and the Union of local authorities (the minority owner of Bibliotekstjänst) also controls a company named Kommundata supplying municipality computer power and systems nationwide, through a network of regional computer centers.

Kommundata and Bibliotekstjänst have so far avoided treading on each other's toes but the recent growing interest in total systems under local control might bring the two companies on converging courses with cooperation or collision as unavoidable result. It goes without saying that these sibling companies would prefer a situation of cooperation to one of competition. And although no depth studies have been conducted it is obvious that interesting contact areas exist e.g. between the library's routines for acquisition and corresponding municipality accounting.

It should be made quite clear that a local authority is free to choose other solutions than the centralized alternatives offered by Kommundata or Btj. This is a fact acknowledged also by Kommundata and as a consequence they offer consulting services for municipalities who want to run their own computer departments.

It is too early to prophesize what a local system with well functioning interface to Kommundata- and Btj-systems would look like. Suffice it to say that the development of such a system would be an interesting challenge as well as a promising one. It certainly would make sense to try to alleviate the effects of the power saw trimming with a smoothly functioning system, combining the long experience and expertise of Btj and Kommundata.

New library terminals

In all future local systems the PC will play an important role and it is only fair to state that the recent concepts where central and local systems blend harmoniously would be unthinkable without the PC. Micro computer technology is not new to BUMS however. It became a vital part of BUMS in 1977 when the first Btj designed RJE-terminal with barcode wand (the VAC 600) was introduced. A couple of years ago a small portable terminal for book mobiles and small branch libraries was added (the Btj 800). A replacement for the ageing VAC 600 is due however and next year Btj will complete the field - testing of Btj 1200 - a multipurpose work-station for BUMS-libraries based on Apple Macintosh. The version 1 of this terminal will perform the same tasks as the VAC 600 but in a more versatile manner. Also, and this is extremely important, it will use standard technology. I suppose this is a lesson that every vendor who wants to stay in business has to learn - never to underestimate the importance of spares. I will not add to the abundant supply of horror stories in this field. Suffice it to say that we are happy to use standard technology.

Later versions of Btj 1200 will be able to take on more of decentralized routines. It would be unwise however to give a detailed account at this stage of the precise future allocation of routines to mainframe, minicomputer or PC.

What happened to the local BUMS system?

Those familiar with the Swedish library scene might be slightly surprised that the "old" centralized BUMS system is treated at such length. At the Library Association convention 1985 Btj advertised local library systems based on cooperation between Btj and the American company CLSI. I am not disclosing any hidden secrets when I tell you that the path of cooperation has turned out to be thornier, steeper and longer than anticipated. That I say this should not be interpreted as a clouded announcement that there will not be any local BUMS system. On the contrary it is my firm belief that such a system will come but today I dare not say when.

And in the meantime a rapid - and planned - development of the central BUMS system will give the local library increased control of local data and narrow the gap to dedicated local systems, while retaining the advantages of centrally maintained services. The future choice between central, regional or local system will probably be quite difficult for most libraries.

The future of LIBRIS and local systems to come

So far I have talked as if public libraries were the only library community in Sweden worth mentioning. Obviously that is not so. I find it more difficult than usual to make reliable prophecies about the future of research library automation in Sweden. It seems, however, reasonably certain that the LIBRIS system will be retained and enhanced. In what ways and to which extent remains to be decided. A study of a possible future LIBRIS IV will be submitted to DFI (Swedish Delegation for Scientific and Technical Information). My crystal ball contains no information about the future of that study.

That further local systems will be installed at Swedish universities is certain, with Lund and Gothenburg as next to come. The Geac System at Stockholm University is operational and seems to behave reasonably well after normal teething troubles. Whether this is enough to persuade Lund and Gothenburg to choose Geac I dont know. It is obvious, however, that the decisions taken by those libraries will have a strong impact on the market for local systems in Sweden. If they become Geac customers, Geac gets a commercially acceptable basis in Sweden and could be expected to expand further as success breeds success. If we see other systems in Lund and Gothenburg the market will remain fragmented and the possibility of future troubles cannot be dismissed. At the northern university at Umeaa IBM DOBIS is believed to have a strong position but no firm decision has been taken as far as I know. And at Ultuna the fledgling RC circulation control system is rumoured to be running after a prolonged period of installation troubles.

Concluding remarks

I am well aware that my crystal ball has revealed few if any sensations to be expected during the years to 1990. The LIBRIS and BUMS systems are healthy adolescents by now and behave as well as could be expected. Speculations about a marriage between the youngsters should not be encouraged however, although the benefits of such a union are much talked about - especially by distant relatives who don't know the alleged contracting parties too well.

Local solutions will become more commonplace but the library may have to comply to overall planning specifications drawn by municipality coordinators. Different models for cooperation with central and/or regional systems can be anticipated.

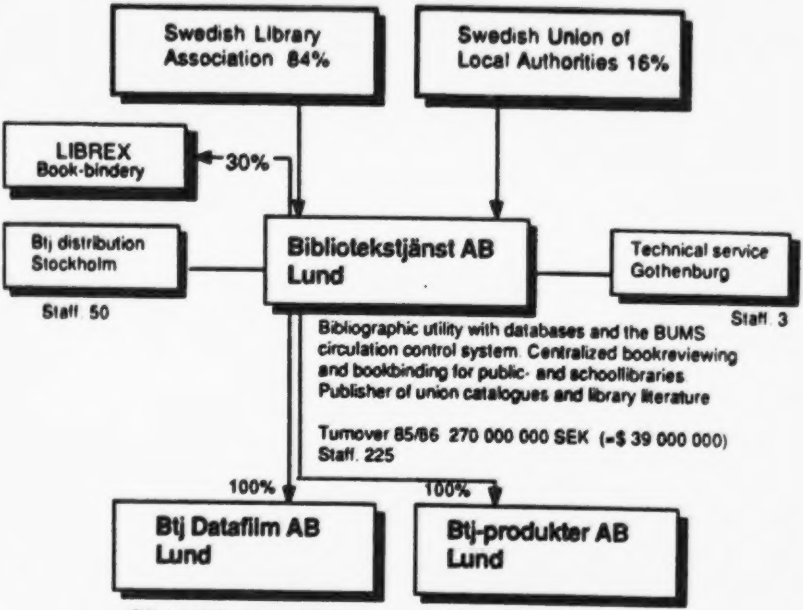
PC:modules for libraries will increase. The libraries will see both standalone modules and modules integrated with centralized systems and/or turnkey systems.

The overall use of databases and CT R:s will increase considerably - especially if pricing structures are changed so that a subscription fee gives unlimited access to the database during the subscription period.

If the standardization work is successful and production facilities become available CD-rom catalogues might appear during this period which might promise the demise of the fiche catalogue.

Catalogue cards will be produced at the end of the period but centralized production may be about to cease as local downloading and printing is becoming more economical.

BIBLIOTEKSTJÄNST


Swedish Library Association 84%
Swedish Union of Local Authorities 16%
LIBREX Book-bindery
30%
Btj distribution Stockholm
Staff: 50
Bibliotekstjänst AB Lund
Technical service Gothenburg
Staff: 3
100%
100%
Btj Datafilm AB Lund
Btj-produkter AB Lund

Bibliotekstjänst AB Lund

Bibliographic utility with databases and the BUMS circulation control system. Centralized bookreviewing and bookbinding for public- and schoollibraries. Publisher of union catalogues and library literature

Turnover 85/86 270 000 000 SEK (=$ 39 000 000)
Staff: 225

Btj Datafilm AB Lund

Offset printing company with photo-composer, laser-printer for catalogue cards and COM recorder for fiche-catalogues. Copying equipment for high volume production of audio-tapes

Turnover 85/86 27 000 000 SEK
(=$ 3 900 000) Staff: 50

Btj-produkter AB Lund

Library furniture and supplies

Turnover 85/86 40 000 000 SEK
(=$ 5 700 000) Staff: 30

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A European Bibliographic Database Centre

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A European Bibliographic Database Centre

Bernard Gallivan
National Library of Scotland

This paper would consider the problems encountered by single library systems attempting to provide users with access to the bibliographic data needed. Linking two or more systems seems on first glance to be a good way of achieving a higher coverage of the required data. Experience in the UK indicates just how difficult this can be even when the systems are all MARC/AACR2 compatible. The problems across national boundaries would be enormous. These would be discussed.

An alternative that would be much more efficient and cost effective (outline costs would be provided) would result from the setting up of a European Bibliographic Data Centre. This centre would hold the combined databases of the various data procedures in Europe as well as the major producers in the rest of the world. This would involve conforming to an internationally agreed standard for bibliographic data.

The costs and problems of setting up and running such a centre would be discussed.

A European Bibliographic Database Centre

Introduction

The possibility of creating a European bibliographic database system will have occurred to various people over the years. Thinking about such a system and getting it done however, are quite different animals since the route towards the creation of such a system is littered with traps and pitfalls of many kinds.

Most, if not all of us here today, have been involved in innovative work in the library sector. Some will have introduced an automated system or systems into a library; others will have designed such a system, whilst yet others will have been or still will be involved in even more adventurous networking projects involving many libraries.

I am under no illusion that the setting up of a European Bibliographic Database Centre will be achieved simply because I say it can be achieved or even will be achieved when I have convinced you that it can be achieved. What I do know is that it will not be achieved unless we all believe it will be of benefit to us and unless we fight for it to come into being. I also believe that we only have a short time window in which to make it happen and before other events cause us to lose the opportunity once and for all.

I recognize that many people have been working towards a system whereby we will all be able to interconnect with each other using the Open Systems Interconnection (OSI) layers of protocols and indeed I am sure that such will shortly be the case. What I am about to suggest will complement this work not compete with it. It is important that we should be able to connect systems together and OSI is the obvious way but, equally obvious, is the need for a central database to provide rapid access to difficult data.

The time for the development of such a system is more opportune now than it has been for many years. You are probably all aware of the recent investigations funded by the EEC to look at developments in libraries and information systems within member states of the EEC. Lib 2 is the name of this investigative stage. Lib 1 and Lib 3 will be the stages when new developments occur. I know that Lib 2 reports are shortly to be presented back to the Commission. The Commission is looking for ways to draw the EEC states closer together and I believe this project has the right dimensions and political kudos to get it accepted.

For some years now the Cooperative Automation Group, a group of British cooperatives, including the British Library, has been meeting and working towards the establishment of common bibliographic standards in British libraries and has also been examining methods for interconnecting their various databases together. The recommended input standard devised by the Bibliographic Working Party of CAG for libraries creating records that they might eventually wish to share with others, has now been published by the British library. Very wide consultation took place before the standard was eventually set and it is hoped that this might lead to the creation of better quality records than has been the case in recent years.

Additionally, work based on the Universal Book Numbering system devised by Fred Ayres, the recently retired Librarian of Bradford University, to merge a large number of databases into one coherent database, was undertaken by the Group when it was hoped that a single, central data-base of the machine-readable holdings of the collaborating cooperatives would be created.

Another area of investigation conducted by the CAG was in identification of the most effective acronym key for headings.

Another working party of the CAG was WAND, the Working Group on Access Methods to the National database. This group was investigating protocols, etc. for use in linking libraries to the central system when its work was largely overtaken by O.S.I. and the Linked Systems Project (LSP) in America.

None of this work has been funded in any formal way, so resources have always been limited. Indeed, because we were unable to attract any resources we were unable, a year or so ago, to set up the planned United Kingdom Library Database System (UKLDS). Instead, ad-hoc, bilateral database interconnections are now under discussion.

The rise of stand alone systems, that is, those systems created by commercial suppliers that do not link with other systems outside the using libraries, has created many opportunities for libraries but has also been the direct cause of a marked deterioration in the quality of data created by a library.

In Britain, some of the most popular of these systems required the library to create all its own data, even when MARC records already existed for much of the data being created. The result of this extra work-load is a reduction in bibliographic standards that is directly counter to the earlier developments when the emphasis was on cooperation. This unfortunate phase is not quite in the past since, although many of the 'stand alone' systems can now accommodate MARC tapes, old habits die hard and many libraries still follow the simpler standards they were forced to adopt in less happy times.

I believe the lessons are being learnt and that the advantages of cooperating with others are now being seen even by some of the more intransigent of the British librarians. We have to open up the concept of data sharing if we are to start to compete with the USA in this area. When a typical British librarian thinks about cooperation, he tends to think about the other libraries in the same town, or perhaps other libraries of the same type in the same county and probably the same could be said about many librarians in countries outside Britain. In America, librarians are just as restricted in their basic attitudes but because of the size of the country, because of the common language and, most importantly, because of the attitude of the National Government through the Council on Library Resources, which has actively encouraged cooperation by giving substantial cash incentives to libraries willing to collaborate with others, very large cooperative systems have emerged in the USA, which in turn has encouraged the creation of huge central databases.

Nothing of that size is available in Europe but in this area there are considerable cost benefits from being large. We must get into the game ourselves. We cannot rely on establishing a few uncoordinated local links between libraries and hope that these will just grow into some sensible, integrated system. No, we must design our grand scheme and keep pushing until it is achieved.

I have no doubt that the simple, bilateral links I mentioned earlier will prove to be of some benefit to the users of these links but I do not believe this to be a sensible way forward for everyone, as I hope to demonstrate in this paper.

What we have to do is look at the way people work. A cataloguer using a modern online cataloguing system will catalogue a wide variety of material. However, other than in very special cases, the majority of the bibliographic data the cataloguer would find useful, is usually found through one or two databases. For example, in Britain most public libraries would find well over 90% of their requirements in both UKMARC and LCMARC. College and university libraries would find perhaps anything from 60% to 75% of their needs through these two databases, but to satisfy 100% of the needs of these libraries the cataloguer would need to search through dozens of different databases. Indeed it is unlikely that a 100% hit rate can be achieved using this system, since a residue of the records needed are likely to be of such a specialized nature that the chance of finding them already available in a database to which the library has access, and has actually got around to searching, is very remote.

Let us imagine that bilateral links are established so that this particular cataloguer can access which-so-ever database might be needed. Can you imagine the frustration of our cataloguer, jumping from one local database to the next; trying to unravel the specific searching methods within each new system, e.g. is it / shakespeare or ? Shakespeare or Shakespeare / or Shakespeare ? etc etc; wasting time logging on and repeating the same search time and time again. If they were prepared to do it once, that would be the last time or I don't know the typical cataloguer. I would expect cataloguers at the National Library of Scotland to throw the terminals at me if I offered them that sort of system.

Later in this symposium, Charles Hildreth will tell us about the difficulties of searching remote databases in far more detail than I am able to do here, but make no mistake, these difficulties are profound. There are as many different ways of searching for data as there are systems allowing such searching. There is no doubt that OSI will enable different computers to talk with each other but if you believe that that is all there is to retrieving data think again. Until all systems adopt a common command language such as the one being advocated by Charles Hildreth, the difficulties will remain. You know suppliers as well as I do and obvious as it may seem to us, being so full of common sense, I suspect a common command language will not be adopted willingly or quickly by them. It is not in their best commercial interests to be too compatible with all other systems. That would make it too easy for their present customer-base to migrate to other suppliers' systems.

I make these remarks not to chastise or castigate suppliers but simply to acknowledge the fact that the world in which we live is a highly commercial world. All organizations, and here I include libraries, are looking for the best deal for themselves. I do not criticize computer suppliers for doing what everyone else is doing but I do acknowledge that these motives exist and this is why I am advocating the European Bibliographic Data Centre to you.

The point I am making here is central to my whole argument and is worth repeating. Even if technology and clever people working out intricate ways to resolve the protocol problems enable us to provide comprehensive bilateral links using OSI or something else, the sheer frustration of trying to find the right database and then trying to work out the correct way to retrieve bibliographic data from the database to which you are presently connected makes this approach unnecessarily complex when compared with the much more straightforward alternative I am proposing. Even the data you retrieve from the OSI approach will be less useful than it would be if retrieved from a central database centre. Standards are likely to be very different if they exist at all. Indeed, the very fact of having national centres contribute to a central European database will encourage the adoption of a unified standard. Clearly this would take time to appear but it will never appear if we do not adopt the unified approach I am suggesting.

We really must not allow ourselves to be persuaded that OSI is the complete answer to data exchange. It is an important step forward but it does not provide solutions to the questions we are presently asking, indeed it never was designed to provide answers at this level of detail.

Please bear in mind that I am not saying that ad hoc, bilaterally linked systems are the only alternative available. What I am saying is that these are what will result if no comprehensive structure is produced and agreed upon. If these bilateral systems continue to flourish, the end result will be a huge and expensive multiplicity of telecommunications lines. I know that some of you will claim that it is possible to reduce the number of lines dramatically through sensible design but I repeat, I am talking about the present situation where no alternative to unilateral links exists. Let us forget such a system and not waste any more of our precious resources worrying about it.

I have alluded frequently so far in this paper to the alternative I am proposing. I now want to tell you about it in some detail. You will see that it is straightforward to implement, involving no new, as yet untried, software or hardware. It could easily be made completely cost recovery and still be by far the cheapest way for libraries to capture data, and it could be up and running in less than 2 years.

Because it will not require a huge expenditure of money on research and development, and because it will not need a huge team of highly skilled people to operate, do not dismiss it as being too simplistic. It genuinely is a simple, straightforward solution requiring only the cooperation of member states and I believe that goodwill already exists.

Let us move forward in time by five or six years. Our cataloguer is slaving over a red-hot terminal but now will probably have local access through mass storage devices, connected to the local computer, to all the usual bibliographic data he or she needs to perform the cataloguing job. In the case of a cataloguer in Britain, both UK and LC MARC will be available on video disc, CD-ROM or something similar. (In fact, both are already produced but the British Library is presently being rather coy about releasing UKMARC). No telecommunications costs will be incurred by this cataloguer for the bulk of the work processed but whenever a record is required that the local database cannot provide, a PSS link will be made between the library and the National gateway. This gateway links the cataloguer to the European Bibliographic Database Centre (EBDC) somewhere in Europe, where the combined machine readable holdings of all collaborating European countries plus the databases of non-European countries, as these are available, are held.

Since the local library will have already searched various databases before connecting to the EBDC, a profile will ensure that previously searched files are not searched again. Indeed it should be possible to select which databases are automatically searched simply by specifying the language of publication. This single point of look-up for all the databases required will make sense to the cataloguer. No frustration and fast access will enable him or her to do the job efficiently and effectively.

The database will be large, possibly more than 20 million items, requiring some 60 gigabytes of disc storage. However, since preliminary searching will have been done elsewhere, the loading on the system should not be enormous even though it will be available to every library in Europe.

The system could be made even more useful by incorporating holdings information in addition to the basic bibliographic information provided. In this case it could be used as an interlibrary lending facility, though in this case the work load on it will then be considerably greater.

The British Library Document Supply Centre already provides an excellent interlibrary lending facility for Europe and I would not want to see this valuable work compromised by the new EBDC and, indeed, it might be logical to consider the possibilities of having both connected together by means of a telecomms link. This actually makes a lot of sense in that the bibliographic data needed by an organization specializing in ILL is of a much briefer form than is data needed for catalogue creation and use purposes. But, in addition, the record of holding of the record will vastly add to the bulk of the already large database. I know that OCLC is intending adding additional holdings information to its large bibliographic file but this is on a selected basis. OCLC does combine the provision of bibliographic data with a sophisticated Interlibrary Lending facility and shows that the two operations can be combined into one central system. However, I suspect that there would be too much conflict if the EBDC attempted to take over an ILL role in addition to a bibliographic data supply function. I would think it prudent to ignore such a possible use of the EBDC, at least initially.

I have already spoken about the possibilities of such a system in various meetings in Britain and I can see that many think I am discussing something so avant garde and expensive that it will never materialize. Indeed, the failure of the UKLDS project has been thrown at me to emphasize this point.

They are wrong and, if anyone here today thinks the same, you too are wrong. We have only to look to America to see that such databases already exist. OCLC makes no attempt to hide their intention to become a world database system. They prove just how possible would be a European system. Large, good quality databases are big business. There is no doubt that such a database would be completely cost recovery.

Now is the time for Europe to get its act together since, if we delay now, we will have lost this tremendous opportunity that will only be available to us for a short while. If we hesitate for too long, too much of our data will have been transferred out of Europe into American databases making the establishment of a European database much less attractive. Once this stage is reached we can say goodbye to ever establishing a European database.

Don't let yourselves be persuaded by anyone telling you that the data is not really lost as it will still be available in Europe as well. Since it will be widely scattered in Europe but gathered together in America where would you choose to search for the data you need?

Others will try to persuade you that we can gather it all together ourselves at a later date but this argument is hollow and false. It is just like the case put forward by some shortsighted librarians for failing to create good quality bibliographic records now because they don't have the resources now. "We will upgrade the records later when we do have the resources", they say. I'm afraid I don't believe they ever will upgrade the records entirely and whatever records they do upgrade in the future will be much more costly than doing the job properly now.

Costs

What about the costs of this wonderful system I am proposing?

Costs fall into three main categories -

Hardware/software costs

Operating costs

Database creation costs

Hardware/Software

Whilst it is possible to conceive of various systems that will provide the sort of power and service needed and indeed this paper does not pre-suppose any specific system, it is clear that what is needed is a fault tolerant, multi-processor system capable of providing fast searching of a 60 gigabyte database whilst serving up to 250 lines simultaneously. If we assume 10 million requests per annum of 250 days, and where 10 hours of service per day is provided (though these really are worse case conditions, and I would expect much more availability from the system, for example 350 days a year, 20 hours/day), this is equivalent to 67 requests every minute. Let us further assume that occasional massive peaking occurs when a maximum of 250 requests per minute can be expected. A system with a 250 lines capability means that queueing will never occur. Indeed, with the model I have postulated no more than about 100 lines would be needed to give good responses for the major proportion of the time.

We must avoid false comparisons. Because OCLC handles many more transactions per minute or even because other smaller systems that you know handle more transactions per minute, that is no reason to suppose that the EBDC will need to handle more than I have suggested. In the case of OCLC, it is used as a first database for the vast majority of its users who find 95% plus of their data on it. It also handles ILL requests and provides various other facilities including massive retro conversion exercises. The same will almost certainly be true for those other systems that you might think of. In the case of the EBDC, it is providing a back-up service for 5% of libraries' requirements. However, in the event that I have grossly underestimated the use made of the EBDC, this use will easily be accommodated by adding on a dozen or more processors - remember we have a multiprocessor system. The extra cost of the processors will be more than paid for by the increased use of the system. The figures I am giving are by no means the most optimistic figures. The greater the use the more cost effective it all becomes.

The cost of a system capable of providing a decent service under the conditions outlined would be in the region of £3 million. It would have 60 gigabytes of disc storage, high speed tapes, printers and a variety of communications equipment. Since it would be a multiprocessor system it would provide continuous service. The interactive service could be provided most of the 24 hour day making it useful to libraries in America, Eastern Europe, Australia etc, in addition to the major European users.

I have no doubt that a wide variety of services and facilities would eventually be provided through the EBDC, but assuming that only an online database is provided initially, the cost of the software would be minimal. However, let us allocate £ 1/2 million for the software.

Operating Costs

Operating costs fall into three areas:

- Hardware maintenance
- Software maintenance/development
- Operations staff costs

Using the industry standard 10% for hardware and software maintenance, a further £3 1/2 million will be required over a 10 year period.

The cost of staff over a 10 year period might amount to a further £2.1 million. Staff costs in Scotland might be less expensive than they are in the rest of Europe which is one very good reason for siting the system in Scotland. However, I am sure that the costs I quote are not very wide of the mark (or DM even) .

6	Operators @ £10.000 p.a. each	£600.000	over 10 y.
1	Supervisor @ £15.000	£150.000	" " "
6	System and Maintenance staff @ £15.000 each	£900.000	" " "
2	Clerical Assistants at £10.000 each	£200.000	" " "
1	Deputy Director @ £20,000	£200.000	" " "
1	Director @ £25,000	£250,000	" " "
		£2.300.000	" " "

Again I appeal to you to avoid making false comparisons. Even if OCLC has 1,000 staff and other cooperative systems have 50 or more staff, these systems are providing a completely different service from the one I am postulating for the EBDC. The services provided by OCLC and others are highly labour intensive. The service provided by the EBDC is not. As you will shortly see, even the integrity of the database I have hived off to the contributing country as their continuing contribution to the total system.

What is important however is that these other cooperative systems rely on the sale of records to support these huge staffs. This is why I know the EBDC could easily be made cost effective. If you are worried by the low pay levels for the staff I have identified let us double them. There is plenty of room for this sort of change.

The cost of accommodation, including heating, lighting, stationery, telephones etc, might require a further £ 1/4 million.

Database Creation Costs

These are much more difficult to estimate. However, I would expect each member state to contribute its national data freely to the EBDC using a common MARC exchange format and indeed one could argue that they were also held responsible for ensuring that it was up to date and of good quality. How the data is held is something that needs much more consideration than I can give to it today. But, to be really useful to the cataloguer and not to involve him/her in the sort of frustration we are attempting to shield him from, it should be possible to search the entire database in a variety of ways. For example, by name, title and subject, with additional fields available to refine and restrict the search, e.g. date of publication, place of publication, language, publisher.

A special tag could be set aside to identify the organization responsible for the creation and maintenance of each record, thus enabling one large database to be created but still allowing easy record maintenance to take place. The argument that there are many database standards throughout Europe and that it would be impossible to collect these records into one database is fatuous and reminiscent of the man who would not start on the walk because his feet might hurt. It would not be necessary to force all contributors to conform to one or even a few basic standards for the data still to be extremely valuable to users, but since it would highlight just how silly it is to have so many different methods of holding data, perhaps the EBDC would encourage the sharing of standards as well as records for the further benefit of all.

Thus, if data for the central database is contributed free of charge by participating member states and if responsibility for keeping this information up to date is also transferred to the appropriate member states, the central cost of this operation disappears.

The total 10 year cost becomes:

Hardware/software	£ 3.50	million
Operaring costs	£ 6.05	"
Total	£ 9.55	"

Call this £ 10 million or £ 1 million/year.

This large sum of money becomes quite small when spread across each of the member states, but assuming that whatever money is provided has to be returned over the 10 year period, we will clearly have to make a charge for each record used. If we assume that only 5% of each library's data requests have to be transferred to the EBDC, the total volume of data transferred from the EBDC to local libraries across Europe would be about 10 million records per annum. Over 10 years the number becomes 100 million. Thus, simply by charging 10p per record the system would be cost recovery.

Clearly, my figures are ball park figures, but I hope I have been able to convince you that quite a large margin exists to ensure the system becomes cost recovery, if indeed it has to. For comparison purposes OCLC presently charges about £ 2 per record! We could treble the cost of the hardware and treble the number of staff involved as well as their salaries and still have an enormously successful and economic system in Europe.

What one has to remember is that it is only those records not readily obtained through use of the most obvious local databases that will be sought from the EBDC. The cost of creating a full MARC record locally, if this has to be done without the assistance of a centrally available record, is high - some have put it at £ 10 per record, which is why the services provided by the bibliographic data suppliers are so successful. In addition of course, it is these residual records which, though few in number, create the most difficulty and generate the longest delays resulting, inevitably, in large backlogs in libraries across Europe.

Another way of looking at it would be to consider the approximate cost of libraries creating all this potentially shared data as local original input data. Remember, we are talking about the difficult residue of records, often foreign language material of varying vintage. Bearing in mind that £ 10 per record is often quoted, a figure of £ 5 per record, both for the intellectual time and effort as well as the keyboarding is a conservative estimate. Nevertheless, the total expenditure amounts to £50,000,000 per annum for 10 million records.

By charging 10p per record, to which must be added a further 50p for telecommunications costs, the total library expenditure becomes £ 6 million per annum, 12% of the cost of going alone.

Of course, what I am not including in this estimate of the cost of alternatives, is the huge cost of buying foreign language material, only to have it kept away from the end users because of understandable delays in handling it in the cataloguing department. A European Bibliographic Database centre will enable benefits to be felt by Treasuries of the member states, by library staffs across Europe and last, but by no means least, by the library users across Europe.

The opportunity to benefit from work already done elsewhere is maximised through the creation of a single European database. The cost and the time needed to create complete catalogue information will be substantially reduced through the use of the EBDC.

Frankly, we cannot afford not to have a European Bibliographic Database Centre.

As I see it, the biggest problem in setting up the EBDC would be in deciding where to site the centre. I hope that member states would be sufficiently mature not to object to a particular location simply out of chauvinistic pique. However, since the most sensible place to site the centre would be at the European demographic centre, wherever that might be, since by so doing, telecomms costs would be minimized, I would hope that this would allay suspicions and encourage full participation in the project.

Clearly, if the idea is widely accepted, a detailed cost analysis would be required substituting those staff cost figures appropriate to the country chosen in which to set up the centre. A full, discounted cash flow would quickly reveal the accuracy of my estimates though I am confident that they are by no means unrepresentative.

To sum up:

1. Databases of the scale I propose for the EBDC already exist.
2. If Europe does not get its act together we will lose the opportunity of creating, managing and distributing our own data.
3. The cost of setting up and operating the EBDC is not huge especially when spread across member states
4. The system can very easily be made fully cost recovery.

Let's do it.

University Faculty Use of Computers for Bibliographic Searching

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University Faculty Use of Computers for Bibliographic Searching

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This paper presents the results of a survey of faculty in 12 departments at 20 American universities with regard to computer resources and use of online bibliographic databases. Computer resource considerations include: types of equipment, location of equipment, and expected future equipment. Searching aspects deal with: familiarity with online vendors, experience with searching databases directly or through university library search services, instruction in searching, frequency of searches, sources for search funds, and factors influencing end user online searching.

Comparisons are made between departments and related to what is generally known about information seeking behavior in various disciplines. Implications for the future of end user online searching are drawn.

University Faculty Use of Computers for Bibliographic Searching

Introduction

In reflecting on the theme of this symposium "Impact of New Information Technology on International Library Cooperation" two approaches come to mind. The one approach might be to consider the potential impact of new information technologies, such as CD-ROM (Compact Disk-Read Only Memory), or one can study the impact new information technologies have already had on existing library functions. When trying to assess the impact of new technologies, it may be even more productive to dwell on a further category; namely, library and non-library information users. One reason for this extension might be that new technologies do not always develop as envisioned, as for example the case of videotext. Perhaps more important, the library needs to become increasingly aware of alternate information delivery systems to which information users have recourse.

As one studies the impact of new information technologies on a broader segment of information users, it becomes clear that the library's role as a provider of information is diminishing. The library's role in collecting, organizing and disseminating information is being undermined by new developments in mass storage devices, computer-based retrieval software, and by electronic access to full text.

Even research libraries, once the bastion of scholars, are feeling the impact as younger, more computer literate scholars, are showing dissatisfaction with college library collections. A recent study by the

Office of Scholarly Communication and Technology (American Council of Learned Societies) of over 3.000 scholars in the humanities and social sciences, indicated that complaints about library collections were most prevalent among relatively recent Ph.D.'s and growing numbers of academic scholars are relying more on materials in their libraries for keeping up with their fields than on their institutions' libraries. Journal collections were in particular severely criticized. The problem of dissatisfaction with the library may be even more severe in the physical sciences. Information seekers are more likely to turn to competitive Information Storage and Retrieval Systems (ISARS) as information producers target information end users with their marketing strategies.

The primary philosophical argument that remains for maintaining the library's viability as an ISARS is that of preservation. The argument posed is that other information providers will maintain only information stores which can be sold. Thus, much of man's accumulated knowledge will be lost as electronic databases are erased to make room for more information. In the very process of writing this paper, the author received an announcement for a State-of-the-Art Institute titled "Government Information: An Endangered Resource of Electronic Age". Even now some librarians envision their roles as trainers of end users in accessing non-library databases. What will their role be when users no longer need training? If the library's role in the communication process is relegated to only an archivist function who will meet the needs of the information poor? At the moment, this alarmist attitude may be premature. Libraries have never pretended to be able to meet the information needs of all people or even all the information needs of some people. As one observes crowded study rooms in libraries and analyzes growing circulation statistics the future of libraries seems assured. Thus, when one considers library cooperation at this point in time, is primarily as a result of the desire to share applications of new information technologies or to develop joint ventures rather than a forces cooperation for the sake of survival. At the same time any external ISARS which deals with the same records as the library or attempts to provide a similar service poses a threat to the library. In many instances new information technologies develop modes of behavior in information users which affect the manner in which libraries are used or not used. In order to establish appropriate library policy for meeting the challenges of new information technology, cooperation between libraries becomes a necessity. Particularly when the impact of changes wrought by new information technologies surmounts traditional boundaries there is a need for international library cooperation.

To illustrate the scenario being described, let us address a specific example which has in recent years been described as "end user online searching". In end user online searching, information users access bibliographic and in growing number other types of databases without really understanding the source of the information or the location of the information providers. The picture was described quite clearly in a paper read at the Second World Conference on Transborder Data Flow by Dr. Jake Koppers. He stated:

> The increasing ease of interconnection and lower costs for long distance communication have had the result that physical national boundaries have little or no relevance to an increasing number of users of computer/communication facilities. They are given a set of instructions, codes, and passwords to sign onto a system, and often do not even know where the computer they are working with is located.

The rapidly changing computer/communication/information technologies have led to the development of electronic information networks, where functional boundaries overlap national boundaries.

For example, the boundaries of an online computer time-sharing system are defined by all the locations from which its users access the system.

A recent example of such an ISARS is the incorporation of the complete text of the American Chemical Society (ACS) research journal file into the STN International database. STN International is the scientific and technical information network operated cooperatively by the ACS and Fachinformationszentrum Energie, Physik, Mathematik, GmbH (Fix Karlsruhe). Features of the system include user friendly search and retrieval software, a single search language accessing all STN files, and an easy cross-over between full text files and CAS Online. Users not only can also need not be concerned about their library being able to deliver the source documents.

The end user searching phenomenon is a direct result of new information technologies, in particular new developments in microcomputing.

With user-friendly software, high speed modems, and large storage capacities, a once cumbersome search process has turned into an easier task.

The proliferation of microcomputers places end user online searching within the grasp of many more information users than ever before. No longer need the user go to the library to have a search performed, or even to search the journal collections. Online search systems provide users with current awareness services and document delivery of relevant text. Users need pay only for the information used. Some systems even permit users to enter credit card numbers and charge only if relevant citations are found. There is no question that this incredible scenario is actually occurring. The real questions become: "To what extent is it really happening? Are users really aware of the capability of searching online? To what extent do they have the appropriate resources available for searching? Are they willing to pay for the result of the searches, and if so, from what funds?". Last but not least remains the question of what role the library will play.

In light of these questions and observations the present study was initiated to shed greater light on the phenomenon of end user online searching or at least the potential for such activity. The study was limited to faculty in American universities since they constitute a clearly defined user population but whose access to appropriate resources are not clearly defined, as say their counterparts in the for-profit business sector. The original study, funded by the Council on Library Resources (USA), actually consisted of three surveys, one of university faculty, one of online coordinators in libraries, and direct interviews with users of online systems. Readers are directed to the final report for additional data. The results reported here are limited to the survey of faculty.

LIMITATIONS OF THE STUDY

The chief limitation of the study is that it is limited to faculty in American colleges. Answers with regard to computing and financial resources, as well as the desire to do online searching may have little relationship to colleges in other countries.

Another limitation is that the study consists of only university faculty. The information behavior of other populations may not be similar. For example, studies of information use in the business environment seem to suggest that end user online searching is quite feasible and resources are adequate to support such activity. However, the behavior of other segments of the population are less well known.

PURPOSE OF STUDY

This paper examines university faculty as potential end users of online data bases and university librarians who would interact with these end users. Research questions addressed are:

1. To what extent are researchers in academic institutions aware of the services and products of online vendors?

2. How much interest is there in (a) using the services of a professional intermediary for online searching; and (b) non-mediated searching.

3. What resources are available for end user searching?

LITERATURE REVIEW

One of the first experiments with end user searching was reported in 1982 by Schwerzel[1] and others at Ohio State University. Investigators noticed that search formulation and choice of terminology were the most difficult problems for those who tried to do their own searching.

The real pioneering efforts in this area was done by Janke[2] at the University of Ottawa. In March 1983 he opened the Computer Search Service for end user searching. Janke[3] has also been a proponent of intergrating end user searching service with existing online reference services, termed "Online Reference". He suggests that librarians should also take an active role in promoting end user searching. This idea is echoed by others. Griffiths[4] believes that the role of the librarian-intermediary will expand rather than diminish with the development of online searching.

Trzebiatowski[5] reports an enthusiastic response to end user searching, using a small sample of 20 searches by students and faculty at the University of Wisconsin at Stout. She concludes that certain searches can be performed successfully by end users on a menu-driven system.

Some librarians believe that the demands on the staff and library in general will increase as a result of end user online searching and that the users will recognize the value of library services even more than in the past. This idea is stressed in the articles of Halperin[6] and Pagell, Griffiths[7] and others. In relation to this new demand on library staff and services, Ojala[8] stresses the need for end user search policies and guidelines which libraries should develop in order to deal with this new library service.

Many librarians have found that instruction is a necessity in end user searching. This has been stressed over and over in the literature as well as in personal conversations with coordinators of the new online references Janke[9] speaks about pre-research counseling in the library and even suggests that librarians consider counseling those who run their own searches outside the library, e.g. in their offices or at home. Friend[10] considers instruction and librarians' assistance to be vital in end user searching. In her experiment with 22 searchers at Pennsylvania State University she offered two class sessions, with a detailed worksheet and an appointment before the actual session at the terminal. She noticed that end users had problems with Boolean logic, with analysis of concepts and with precision. As a result of librarians' assistance, she noted an increasing respect for the librarian and concluded that "Librarians have a unique opportunity in this age of information to play a major role in the online education of many individuals". With respect to equipment access, David B. Welch[12] surveyed 293 colleges and universities to determine the extent to which libraries are involved in making microcomputers available to patrons and circulating software. He found that 13% of those libraries surveyed circulated software and 28% had microcomputers available for patrons. Welch makes an argument for libraries collecting all kinds of materials, regardless of format. He also speaks about proliferation of microcomputers in academic libraries, a fact which may directly affect future expansion of end user searching.

University faculty use of databases was a subject of a survey by Borgman[13] and others. They surveyed 237 faculty at 10 universities in the USA and Canada. Faculty from 6 departments in sciences and social sciences were randomly selected. The authors concludes that a strong demand for databases by faculty end users does not yet exist, that personal searches by university faculty are not widespread, and that even awareness of available databases is quite limited. They also noted university faculty lack of interest and lack of understanding of computer databases and their potential for scholarship.

METHODOLOGY

The present study addressed three broad questions:

1. to what extent do faculty have access to computing resources and funds which could be used for searching?

2. How widespread is knowledge of online searching in general, and more specifically, what is their desire for doing online searches, and

3. To what extent do faculty use print and computer resources in support teaching and research interests?

This paper focuses primarily on responses to the second question.

The sample for the first survey consisted of 4.000 university faculty drawn 20 academic institutions. Twelve departments/schools were selected to represent the three major disciplines commonly referred to as the physical sciences, social sciences, and humanities. Department units at each university ranged from 9 to 12, the mode being 11. For convenience they will hereafter be referred to as college and department, without consideration to how each unit would prefer to be called. Colleges were selected from a 1982 list of 113 institutions that were members of the Association of College and Research Libraries (ACRL). Non-random selection of the colleges was based on current-fund revenues received from the federal government as indicated in the 1982 Digest of Education Statistics. The five highest-funded and five lowest-funded colleges were selected in the event that financial resources were to become a future research question. The remaining 10 colleges were selected to provide a

FIGURE 1.

Number of questionnaires sent and returned with an estimate actually distributed, by department

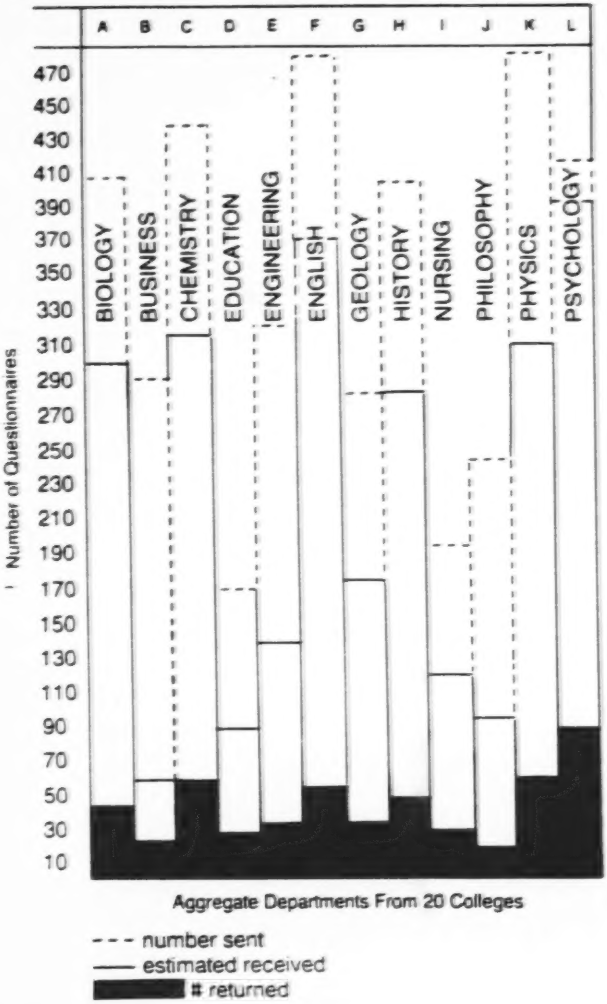

TABLE 1. - Faculty Questionnaires sent to and returned by Departments

Departments Colleges	A	B	C	D	E	F	G	H	I	J	K	L
Johns Hopkins	30/7	10/0	20/2	0/0	15/0	10/0	15/0	20/0	0/0	10/0	20/0	15/4
MIT	35/0	45/0	20/0	0/0	30/0	10/1	20/0	10/0	0/0	15/2	55/0	10/0
Stanford	20/3	0/0	20/2	0/0	20/0	20/1	20/2	20/3	0/0	20/2	20/0	20/3
Washington	20/0	25/0	20/2	10/0	20/8	15/3	20/2	20/11	10/0	10/0	15/0	10/2
Arizona State	10/3	10/1	20/2	15/7	10/0	30/3	10/3	15/3	20/7	15/1	20/2	20/3
Delaware	25/2	15/6	25/7	10/4	10/1	35/5	5/0	25/2	15/4	10/2	10/2	10/1
Florida State	20/3	20/0	20/5	20/0	10/2	10/0	20/1	10/0	20/5	10/2	20/1	15/2
Illinois	15/0	25/0	20/0	10/0	25/3	25/3	10/0	15/4	10/0	5/0	25/0	25/5
Kentucky	20/2	15/0	15/2	15/1	10/0	20/0	10/1	20/2	20/0	10/1	25/5	15/5
Cal-Berkeley	15/0	35/0	35/3	0/0	30/0	40/4	15/1	40/6	0/0	10/0	10/0	30/4
Colorado U.	10/3	10/0	20/0	20/3	10/2	30/2	15/1	15/0	0/0	10/0	25/7	30/5
Michigan	40/1	0/0	30/10	0/0	15/4	40/6	15/0	35/0	0/0	15/0	35/6	45/12
Northwestern	15/4	0/0	25/3	20/0	0/0	30/0	10/0	20/1	0/0	10/0	25/3	20/4
Ohio State	15/2	10/3	30/4	10/0	35/0	30/4	15/5	25/3	0/0	15/0	30/0	30/5
Oregon	20/0	10/0	20/5	15/6	0/0	20/0	20/3	20/1	0/0	20/0	20/4	20/6
Pennsylvania U.	25/3	15/3	15/0	0/0	10/0	25/0	5/2	20/1	20/0	10/1	30/3	20/3
Princeton	20/4	0/0	15/0	0/0	20/2	30/3	15/0	25/3	0/0	15/0	35/7	20/1
Rochester	20/1	0/0	20/4	0/0	15/3	25/3	10/2	20/5	30/3	10/2	20/3	25/6
Utah	25/1	15/1	20/11	0/0	15/0	20/2	15/0	15/0	25/5	10/0	20/2	15/3
Wisconsin	10/3	30/6	30/0	15/3	15/5	20/9	10/4	15/2	15/6	10/1	20/4	15/1

KEY

A	Biology
B	Business
C	Chemistry
D	Education
E	Engineering
F	English
G	Geology
H	History
I	Nursing
J	Philosophy
K	Physics
L	Psychology

geographic mix. A total of 473 usable questionnaires were returned, resulting in a non-adjusted return rate of approximately 12% or a return rate of 20% if adjusted for non-responding departments. See Table I and Figure I for specific data Demographic data was limited to rank, years in the subject area, years as a faculty member, area of specialization, and primary research interest. Due to the vast amount of information that could be derived from the results the following report will be limited to a presentation of basic frequencies for responses to individual questions and a few of the more interesting cross tabulations. The first section of the questionnaire intended to confirm the assumption that most faculty have access to terminals or microcomputers. As expected, 96% of the respondents indicated access to equipment, with 98% of this group having access to microcomputers. However only 52% of the micros had modems. A fairly high number indicated access to equipment in their office (77%) and/or at home (78%). IBM equipment constituted the largest single group for both present and expected equipment, although this data may already be obsolete in light of several newer popular IBM clones. On the basis of these results one might conclude that lack of equipment would not be a major factor in end user searching. Put another way, librarians interested in training end users might well take the training to the user, rather than expecting the user to come to the library. Major disadvantages might be lack of familiarity with the user's equipment, and appropriate software.

The next part of the questionnaire inquired about both a general knowledge of online searching and actual searching, either directly or through an intermediary. Source of funds for searching was also considered. Ninety-two percent of the respondents had heard of online searching, but only 18% appeared comfortable with the subject (as indicated by checking numbers 4 or 5 on a five point Linkert-type scale). Thirty-seven percent of the cases said "yes" to the question "Have you used an online system?", while 78% indicated that searches had been performed for them. Eighty-six percent of all searches were performed in the library. Dialog accounted for 28% of the online systems used, although 37% of the subjects who searched indicated using more than one system. With respect to funding, for searches performed for the subjects, grants accounted for 39% followed by 24% from department sources. The same two sources accounted for funds used for end user searching. At the same time, lack of funds, as well as no need to search, were the main reasons for not having online searches done. Twenty-one percent of the respondents had actually performed searches, i.e. the "end user" population, with 29% of the searches being performed in the library and 26% at home. Sixty percent of these individuals received instructions on searching from the library. The remainder learned about equally from colleagues, at conferences, or on their own. Seventy-three percent of those cases who were not end users indicated a willingness to learn. Ninety-three percent of all respondents indicated that they would have future searches done for them while 89% would consider doing their own searches. The reasons given by the other cases for not considering future searches were spread equally across: no interest, no skill, no need, and no funds.

Before examining some characteristics of specific departments, a few conclusions are in order. Based on the high number of individuals who expect to have searches performed in the future, and would like to receive instruction in searching directly, it appears that the potential for end user searching is quite real. At the same time a number of problems still place serious obstacles in the path of librarians who might become more involved in training potential end users. One obvious problem is the frequency with which searches are done. Only about 33% of all respondents who search or have searches done, search more than 3 times a year. It is difficult to imagine that even the end users would not realize the inadequacy of their own searching in light of forgetting the mechanics of performing the searches. Even with menu-driven systems searching is awkward at best for the inexperienced searcher. Probably the biggest handicap for the librarian-trainer, in addition to being familiar with various search systems and equipment, is being able to communicate in the language of the end user. The remainder of the discussion dealing with the first survey deals with essentially the previous results but tabulated across departments. No attempt was made to consider department within a specific college. It might be best to begin by listing the departments that were surveyed. These were: Biology, chemistry, physics, engineering, nursing, geology, business, education history philosophy, psychology, and English. All departments high access to equipment, the lowest value being history with 84%. With respect to microcomputer access, the lowest value was 93%, as reported by physics. No significant differences between departments were recorded for the question regarding familiarity with online searching. All departments indicated high levels of familiarity. With regard to actually using online systems, the science departments showed the highest values, although education also was quite high. This might be explained by education's use of microcomputers, as well as familiarity with the ERIC (Educational Resources Information Center) system. Interestingly, physics showed one of the lowest interest rates in having used an online system, as well as a low rate in an interest in learning how to search. A number of disciplinary reasons could be forwarded, although at this point they are but poor hypotheses. One reason might be the strong invisible college in physics, as well as the tight bibliographic control exhibited by the AIP (American Institute of Physics). There might be no need to search across many disciplines in a highly theoretic field. Another might be that the frequency of experiments is lower than in other sciences, creating less need for frequent literature searches. The social sciences and humanities showed considerably lower values in having used online systems (with the exception of education). For example, English showed only a 23% level of online use, but 94% interest in learning how to search. Similarly, philosophy showed a 17% use to 86% interest level, and business a 20% to 78% ratio. Although further analysis is in order, these results corrobate earlier studies that consider information needs across disciplines. For example, some researchers believe that information in the social sciences and humanities is scattered across more indexing and abstracting journals, consequently increasing the value of online access. Since the ability to pay for searches plays an important part in online searching, a cross-tabulation was performed between departments and source of search funds. It was interesting to find (although not unexpected) that the departments showing the greatest interest in wanting to search also had the least money. Put another way, the searchers would have to use department or personal funds. To summarize, science departments used to pay for searches, with departmental funds coming in as a distant second source. For example, approximately 60% of the searches in biology, chemistry, physics and engineering were paid for from grants. In the sciences departmental funds accounted for approximately 15% of the searches, with personal funds contributing less than 1%. Nursing and geology were exceptions in that departmental funds equaled or were slightly higher sources for searching. At least in the case of nursing, it might be safely assumed that there is greater reliance on printed sources for information rather than on the results of experiments as in the other sciences. Departments are more likely to fund online searches for such areas. The existence of the Medline files is also probably a significant factor. At the same time over 50% of nursing searches were paid for from personal funds. In contrast, education departments only received 10% of their online search funds from grants, English departments received 29% history departments 9%, and so on. The pattern that emerged was that the sciences use primarily grants for online searching, the social sciences rely on (or at least) department funds as their primary sources, and the humanities use more personal funds. One might expect that grants are a more ready source of funds in the sciences than in other disciplines. At the same time, the apparent willingness to search is not as much influenced by the availability of funds as by the availability of information sources. One might assume that proportionately there is more information available in online databases for the sciences than for the social sciences and the humanities. That is, there is a greater reliance on the non-journal literature in the social sciences and humanities than in the sciences. One might then expect that there is a commensurately greater reliance on books in the library for the social sciences and humanities, and a greater reliance on colleagues and scanning personal journals in the sciences. This assumption was borne out by responses to several questions. To summarize, scientists are less likely to go to the library than the other faculty. Scientists are also less likely to call the library for information and are more likely to call a colleague for information. Reliance on personal files did not differ significantly between disciplines.

The present study seems to indicate that information seeking patterns both manual and machine-based can still be described according to traditional disciplinary variations. Further studies of information seeking behavior are in order, particularly of non-library based information use.

It is the responsibility of librarians to initiate such studies and make use of the data in designing future systems and formulating policy. As the nature of electronic databases changes, it becomes increasingly important that libraries around the world share their knowledge with respect to information seeking behavior and system design in order to serve future generations.

Summary and Conclusions

The paper began with a scenario which pictured decreasing reliance on libraries as a source of information by information users. The chief reason for this observation was an examination of new information technologies which tended to develop systems that competed with libraries as providers of information. The intent was not to show that libraries themselves are not users or innovators of new information technologies. However, the fear was implied that libraries will develop increasedly sophisticated systems for collecting, organizing and accessing information which will be used by a decreasing number of persons. The present study demonstrated that in academia the potential already exists for users to search for information through remote access systems. It has been clearly shown by others that the same phenomenon is already in place in the business sector and it is conjectured that database providers will next target home users.

The phenomenon, termed "end user online searching" is still in its infancy, despite predictions that it has already run its course. The nature of end user searching is still not clear due to rapid advances in new information technologies but growing sophistication on the part of future information users seems to indicate the phenomenon will continue to grow. At the moment, financial considerations rather than lack of knowledge appear to be the primary handicap which restricts greater use of non-library online systems. As information costs decrease and/or information users become accustomed to paying for information, library-based ISARS will see less use. Whether or not the decline in library systems creates an information poor society remains a sociological research question. Libraries cannot afford to wait.

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OSI - application protocols

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The OSI network model has 7 layers. Each layer gives services to the layer above and depends on services from the layer below. Exceptions from this are the first layer which does not depend on a lower layer and the seventh layer which gives services to an application and not another OSI layer.

On the layers 1 - 3 there is one protocol (X.25). On layer 4 there is "one" protocol, but 5 different "classes" of the protocols. On layer 6 there is not yet any protocol, but one discusses the need for application-specific protocols. On layer 6 there will be several protocols. Already we have a file-transfer protocol, a protocol for interactive service, one for message-handling systems etc. The definition of all these protocols takes place in ISO TC 97. The definition of application protocols for library- and information systems is taken care of by ISO TC 46.

Peers on a layer communicates by exchanging messages. The general format of a message is:

<header> <datafield>

The contents of the datafield is the message to/from the layer above.

For layers 1 to 5 there is no connection between the contents of the header and the contents of the datafield. The processes handling the messages on these layers do not inspect or process the message to/from the layer above.

On layer 6 the processes handling the messages will also "process" the message to/from the layer above. E.G. will it converts the message into another character set.

On layer 7 there are two alternatives:

1) No connection between header and datafield which

means that the datafield must have a fixed format (and may be fixed length fields).

2) The header consists of some control fields and some fields describing the contents of the datafield. This means a variable format.

ISO TC 46/SC 4/WG 4 has started the work on a standard for an application protocol for library and information systems. The work is based on two work items:

- the LSP application protocol
- the BIBNETT application protocol

The paper discusses the similarities and differences between these two protocols and describes the state of the art for these protocols and for the work in the ISO work group.

OSI - application protocols

The OSI model - state of the art

The OSI network model has 7 layers. Each layer gives service to the layer above and depends on services from the layer below. Exceptions from this are the first layer which does not depend on a lower layer and the 7th layer which gives service to an application and not another network layer.

For the layers 1-3 there is one protocol (X.25) which has become a de facto standard and which has been around (and accepted) for many years. I do not know if it has, or ever will get, an ISO number. On layer 4 there is "one" protocol but 5 different classes of it. These classes are again divided into two groups:

1) class 0 and 1;	supposed to be the cheapest solution for uses of networks where you pay mostly for the amount of data transmitted
2) class 2, 3 and 4;	supposed to be the cheapest solution for users of networks where you pay mostly for connect-time

For a long time one has talked about removing class 0, but so far it is still there and many are using it.

The protocol for the 5th layer (session) became a standard about a year ago.

On the 6th layer (presentation) one has chosen to define a presentation kernel i.e. a minimum "set" of functions and the protocol was sent out as a DIS (Draft

International Standard) in June this year. At the same time the DIS for a CASE kernel (CASE Common Application Service Element) was sent out. The CASE kernel defines the interface between the presentation layer and the application layer.

On the application layer there will be several protocols, some have become standards, some are in an advanced state within ISO and for some the work has just begun.

Message switching - how is it performed

Communication between two peer processes in a network is performed by exchange of messages. When a network connection has been established between two applications (A on computer X and B on computer Y) they can communicate by exchange of messages. A message from A is delivered to the application layer and wrapped in an application layer message. Then this message is sent to the presentation layer where the presentation "wrapping" is put on outside the application wrapping. This is then sent to the session layer, to the transport layer, network layer etc. and each layer puts on its wrapping. Finally the whole bitstring is transmitted (1th layer) from X to Y. In computer Y the message will float upwards through the network layers and each layer will "peel off" it's peer's wrapping. Finally the application layer will unwrap the innermost network-data and send the application A's message to application B.

The figure below visualizes this. The "wrapping" that each layer puts on the message differs in type and length from layer to layer. The figure below does not indicate the real number of bytes in each field.
In the left column the message is shown in the form the layer delivers it to the layer below. In the right

column the message is shown in the form the layer receives it from the layer below.

```
X                                                     Y

   Process                                  Process
      A                                         B

   dddddddddd                               dddddddddd
      !                                         ^
      v                                         !
AAAdddddddddd        Application         AAAdddddddddd
      !                                         ^
      v                                         !
PPAAAdddddddddd      Presentation      PPAAAdddddddddd
      !                                         ^
      v                                         !
SSSPPAAAdddddddddd     Session      SSSPPAAAdddddddddd
      !                                         ^
      v                                         !
TTSSSPPAAAddddddddddT Transport  TTSSSPPAAAddddddddddT
      !                                         ^
      v                                         !
NNddddN....NNddddN      Network     NNddddN....NNddddN
      !                                         ^
      v                                         !
LNNddddNL..LNNddddNL     Link     LNNddddNL..LNNddddNL
      !                                         ^
      v                                         !
      ...............   Physical    .............
```

Every network message consists of three parts:

<header><datafield><tail>

The header is required, but both the datafield and the tail may be empty.

On layer 1 - 6 the datafield, if present, contains the message from the layer above and therefore the content of the datafield is completely independent from the header.
A process on layer n, where n is one of the layers 1 - 5, receives a message from the layer n+1 and places it in the datafield of the n-message without any

processing of the message. A process on the 6th layer, however, may process the message received from the 5th or the 7th layer, e.g. perform a character conversion.

Application layer protocols

There are several application protocols, one for each type of application. Some of them are:

- File Transfer Protocol (FTAM)
- Message Handling System Protocol (MHS)
- Virtual Terminal Protocol
- Library Functions Protocol(s)

Library and information systems can use many of them e.g. the file transfer protocol, the message handling protocol and specific protocols for library functions (IR, ILL etc.).

The FTAM, MHS and Virtual Terminal protocols have been defined by ISO TC 97, while the library specific protocols will be defined by ISO TC 46.

The file transfer protocol can be used for transfer of larger amounts of data (many MARC records, authority files etc.). The message handling protocol can be used in interlibrary lending functions (e.g. electronic mail part of the protocol). The library-specific protocol will be used in acquisition, cataloguing, reference functions etc. The virtual terminal protocol can be used in Intelligent Interface programs and it is used today in searching remote databases.

Which service to be used will depend on how much data to be transmitted and how quickly a response must be received (1 minute, 2 days etc.).

Application protocol for library and information systems

It is necessary to define a specific application protocol for library functions. This protocol must cover at least the following functions:

- general
  - initialization
  - billing/accounting/statistics
  - record updating
  - record retrieval (searching/retrieval)
  - access control (identification/authentication)
  - directory functions
  - (file transfer) (start of a file transfer at a later point of time)
- specific
  - interlibrary loan
  - acquisition/serials control
  - document retrieval
  - electronic document delivery
  - cataloguing

Each of these functions can be divided in several subfunctions. For instance the main function record retrieval consists of

- index browsing
- subject search
  - thesaurus search
  - classification schema search (chain index etc.)
- authority file search
- bibliographic search
- present records
- choice of database
- help
- result set manipulation (save, delete, use)

When the functions and subfunctions have been defined, one must define the message types required for the function. For instance the function "index browsing" requires the following messages:

- index search request
- index search response
- pageing request

For each message type one must define the type of information to be included in it and which part of it will be required and which will be optional. This is generally known as defining the data elements for the function.

The next step is to define the message structure and how the information should be represented in the message.

The general structure of the message must follow the message structure in the OSI model i.e.:
<header><datafield><tail>

On the 7th layer, however, there doesn't seem to be any need for the tail, so we can leave that empty. We are then left with the header and the datafield.

The question is then which type of information should be carried in the header and which in the datafield. There are three alternatives:

1) Complete independence between the header and the . datafield. The header contains general information in a fixed format. The datafield is structured, partly in a fixed format.

<header><datafield>

2) The header consists of partly general information and partly description of the datafield. Both header and datafield have a variable format.

<header><datafield>

3) The header is independent of the datafield and contains general information in a variable format. The datafield has a substructure consisting of <subheader><subdatafield> which can be repeated. The subheader, which ought to be called a preamble, will contain the description of the following subdatafield.

<header>< <preamble><data> <preamble><data><operators>>
datafield

Each alternative has it's advantages and disadvantages.

The two existing protocols, the LSP and the BIBNETT protocols, in this field are work items for the ISO TC 46/SC 4/WG 4.

In the LSP protocol one has tried to define the message structure according to alternative (1), but one has made some exceptions from the independence requirement. In the BIBNETT protocol the message structure is according to alternative (2). The LSP protocol has been changed considerably during the last year and I think that the best solution for a library application protocol is the third alternative. Both the LSP and the BIBNETT protocols can easily be modified in that direction.

The next question is:

> How should the information in the header and in the datafield be represented?

Some of the information can be sent as codes (e.g. 40 means search, IS means ISBN etc.) and some as text. The information codes, should they be characters (ASCII, EBCDIC etc.) or binary integers or a mixture of both? Are information systems able to process a message where binary integers are mixed with for instance ASCII characters?

The codes will of course never be seen by the end user. They will be processed by the library systems (i.e. placed in the messages or retrieved from the messages and acted upon).

Questions/tasks for ISO TC 46/SC 4/WG 4

The ISO work group will have to decide the following:

- functions to be covered by the protocol(s)
- required and optional data elements in each function and in each message
- general message structure
- data representation in the header fields and the datafields
- error handling

Conclusion

It is hoped that the ISO work group will be able to finish its work reasonably soon. That means that it will be possible to establish real library systems' networks where the systems do communicate. This again will solve many of the organizational and economical problems of "union catalogues" for several countries. We can forget about establishing a physical union catalogue and instead establish a logical one.

The CD-ROM technology may diminish the use and need of a systems' network, but not eliminate it. The CD-ROMs will not give the user a completely updated database. For time-dependant information and for "news" the system-to-system communication will be the best alternative for many years to come.

The U.S. National Standard Command Language for Online Interactive Information Retrieval: A Status Report

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The U.S. National Standard Command Language for Online Interactive Information Retrieval: A Status Report

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Committee G of the United States National Information Standards Organization (NISO) has been working to develop a standard for a common command language. In March 1986 the proposed standard was circulated to NISO's voting members for review and comment. The purpose of the committee's draft standard is to specify "the vocabulary, syntax, and operational meaning of commands in a command language for use with online interactive retrieval systems". When the standard is adopted by NISO, it is anticipated that many online search systems that employ a command language will either adopt the standard commands as a native language or support them as a search option.

The goals of NISO Committee G are to produce a uniform, common retrieval language that is easy to learn and easy to use. The standard is the most promising means of achieving this end in a relatively short period of time. More than 300 online retrieval interfaces are in use today, and new online catalogues and CDROM search software appear each month. No single command language has become the de facto standard. The popular 1985-1986 International Command Chart from ONLINE, Inc. attests to this, and illustrates the diversity of the command languages currently in use in North America and Europe.

In many surveys, both new and experienced searchers of online systems have expressed a strong desire for a uniform retrieval language. The NISO draft standard, reflecting the opinions of 11 committee members and many interested observers, provides an improved command language that can be implemented by most of today's retrieval systems. What it means to adopt and conform to this standard, a matter of some confusion and misinformation, will be explained. In addition, portion of the proposed command language will be illustrated to explain the committee's decisions regarding command names and syntax.

THE U.S. NATIONAL STANDARD COMMAND LANGUAGE FOR ONLINE INTERACTIVE INFORMATION RETRIEVAL: A STATUS REPORT

What is the status of the U.S. standard command language?

Committee G (Common Command Language for Online Interactive Information Retrieval) of the United States National Information Standards Organization (NISO) has been working for the past two years to develop a standard for a common command language for online search and retrieval. This work included careful consideration of the ISO draft (DP8887) command language standard and took into account the many comments that have been issued worldwide in response to that draft proposal. The committee issued its initial draft in February 1986, and from March - May 1986 the proposed standard was circulated to NISO's voting members and others for review and comment. The committee received comments during the summer of 1986 and is in the process of revising the draft standard to respond to many of the suggestions. The revised draft will be complete in early 1987, and will be distributed shortly after for balloting.

What does the standard command language look like?

The language is terse but English-like in syntax, and generally uses a verb-object structure. It may be viewed as a special purpose subset of English. An excerpt from the draft standard will serve to illustrate this structure:

> 3.1 Command Structure. The following general command structure is applied:

command expression = command word + command
specification

Command expressions begin with a command word or abbreviation. Not all command expressions require a command specification.

Examples: command word	command specification
FIND	bank? AND insurance
SCAN	SU marine biology
EXPLAIN	commands
STOP	

This language style was chosen in preference to a "natural language" because it can express a request or instruction concisely, clearly, and precisely, in contrast to the often verbose ambiguity of English.

Many existing information retrieval systems had representatives on the committee, including DIALOG, WILSONLINE, Chemical Abstracts STN, OCLC, and the Library of Congress' online retrieval systems. Efforts were made to include words that are already in general use for command names, without violating the intuitive verb-object relationship. Thus, the command for selecting a database is CHOOSE, not FILE or BASE, because CHOOSE is a verb that instructs the system what to do.

Other command verbs in the standard are HELP and EXPLAIN, START and STOP, SCAN (for viewing index terms), FIND, DISPLAY, PRINT, SORT, SHOW (for session related information), and SET (for changing session parameters such as screen size and display format). In all, twenty commands were defined, plus a set of logical, ranging, truncation, and proximity operators.

See Tables 1 and 2 for a complete listing of the proposed standard commands and operators.

The committee undertook the difficult task of keeping the commands as simple as possible, and keeping the need for special codes and punctuation to a minimum. The FIND command presented the greatest challenge, and the resulting command structure at least keeps the complexity of the command syntax in proportion to the complexity of the functions to be performed. Only complex search command require a complex syntax. For example, FIND interleukin-II, or, FIND AU mann, thomas, would be acceptable commands.

What does it mean to be in conformance with the standard?

In the formal language of the draft standard,

2.2 Conformance. An information retrieval system conforms to this standard when it recognizes any command specified herein and performs the function described for the command in this standard. If a function is not available or cannot be performed by means of, or in accordance with, the standard command, the system shall so inform the user.

Any function provided in a particular system that is included in this standard shall be available to the user through a command that conforms to the vocabulary and syntax specified in this standard. Unexpressed, implicit command verbs are permitted, but if the user explicitly enters the command verb, the system shall recognize and accept it. The standard command words may represent synonyms or implicit command words in the system's own command language In short, if a function is available, it must be accessible and invokable by the standard command.

The standard does not require information retrieval systems to have a command language user-system interface.

Commands for functions not included in this standard should conform to the general command features and rules of syntax specified herein.

To paraphrase: if a system is in conformance with the standard, it can respond to any command specified in the standard, and will respond with the function that the standard describes for that command. If the system cannot perform a function, it simply informs the user that the function is not available. For example, the standard specifies that the command CHOOSE is to be used for selecting or changing databases. A conforming system must be able to accept the command CHOOSE meaning "select a database". It may have its own different command for this purpose, perhaps SELECT or FILE, but it must also accept CHOOSE. If the system does not provide the function of selecting or changing a database - perhaps it only searches a single file or database - it must simply provide a message saying that it is not possible to choose a database. It is not acceptable and in conformance with the standard to respond that CHOOSE is not a command word, or give a response like, "INVALID COMMAND"!

Does this standard dictate that all modes of interaction between a user and a system must be "command driven", using the standard language?

It is important to understand what the standard does not prescribe or require:

2.1 Scope. This standard applies to all online interactive information retrieval systems which use a command language for user-system interaction, irrespective of the nature of the data or databases involved (e.g., bibliographic, textual, numeric, chemical, etc.).

This standard does not prescribe or restrict the functions that a particular information retrieval system must implement; thus it does not represent a minimal, a basic, or an exhaustive set of functions. The choice and number of functions provided is left to the individual system designer. Some retrieval systems may incorporate fewer functions than specified here; others will use additional functions.

In addition, the standard does not restrict or prohibit the use of other modes of user-system interaction such as menu and natural language interfaces, or the use of a "native" non-standard command language along with the standard language. However, if the meaning of the standard command conflicts with the meaning of a command in the "native" language, the function of the standard command shall be performed.

The standard does not require that every information retrieval system have a command driven interface. The standard applies to systems which do have a command language dialogue mode. Also, it does not specify what set of functions must be made available, nor that specific functions may only be performed by means of the standard commands. It only requires that if a function is available, it must be accessible by means of the standard command, even if this command is merely a synonym for the system's own command.

Is there really a need for such a standard language?

The draft standard addresses this question in this manner:

1. Purpose

This standard specifies the vocabulary, syntax, and operational meaning of commands in a command language for use with online interactive information retrieval systems.

There is a great diversity among the many command languages used for online interactive information retrieval. New retrieval systems with new and different command languages are proliferating rapidly. In vocabulary and syntax, there is little uniformity among these command languages, although common functions are supported by today's retrieval systems. A a result, different commands are required to perform the same functions on different systems. By providing a single, uniform command language, a standard command language will produce these benefits: 1) users will not have to learn more than one language to perform similar tasks on different systems, 2) the use of different systems will be facilitated, 3) users and designers alike will achieve a better understanding of the common functions of online information retrieval systems, and 4) a standard, common command language will simplify the implementation of intersystem searching in a linked-systems environment.

The text of this standard is intended to give guidance to designers of information retrieval systems, including online library catalogs and "gateway" or "front-end" database access and search facilities.

Is it too soon, or too late, to adopt a standard command language for information retrieval?

There is clearly a danger in formulating standards in an area where research and development are still in the experimental stage and new theories and discoveries abound. The opposite danger is in allowing market-driven development to proceed in many different directions too long at the detriment of the users of systems who must cope with needless diversity and lack of uniformity when using many systems which do pretty much the same thing. There has been an abundance of command language research in the last fifteen years, and many command languages exist for information retrieval; some have been around for 15-20 years. The committee believes that we have passed the first danger and are now risking the second, especially as many new command interfaces are appearing with an explosion of new online library catalogs and the new optical disc-based search products. We and the users of these systems have more to gain than we have to lose by providing a standard, uniform language at this time. The committee has taken both practice and sound research into consideration in its work; a near consensus seems to exist on our basic approach, of not every detail. No single existing command language could serve as the standard, but the best features of existing languages - guided by human factors and linguistic research findings - were incorporated into the standard command language. We are pleased with the wide support shown for our efforts to date, and we are incorporating several fine suggestions received over the past months in our revised draft, to be completed early in 1987.

Table 1
Primary Command Words and Abbreviations

Command Word	Abbreviation	Function
BACK	BAC	To view preceding displayed data or items on a list.
CHOOSE	CHO	To select file(s) or database(s) database(s) to be searched.
DEFINE	DEF	To create user macros, to rename a command word, or to name a command expression with a word.
DELETE	DEL	To delete searches, saved items, PRINT requests, or defined commands.
DISPLAY	DIS	To view online the results of searches of the database(s).
EXPLAIN	EXP	To obtain information about the system, its use, and its database(s)
FIND	FIN	To enter a search statement.
HELP	HEL	To directly obtain online assistance or instruction specific to the context of the interaction.
KEEP	KEE	To identify and save specific sets and/or records from previous search results.
FORWARD	FOR	To view continuing data, or data following displayed data or items on a list.
PRINT	PRI	To request offline printing.
RELATE	REL	To view terms logically related to search term.
REVIEW	REV	To view search history.
SAVE	SAV	To save search strategies for subsequent use.
SCAN	SCA	To view an ordered list of index terms.
SET	SET	To set or override default parameter values.
SHOW	SHO	To view session parameter default values and non-instructional system or session information.
SORT	SOR	To arrange search results by specified field(s).
START	STA	To initiate a session.
STOP	STO	To terminate a session.

Table 2
Command Operators, Symbols, and Punctuation

Operator/ Symbol	Function
AND NOT OR	Bolean operators.
()	Parentheses. To specify precise grouping of elements in a search statement.
#	Character masking operator (single characters).
?	Truncation operator (any number of characters).
GT	Greater than. Used to assign a value or a range values.
LT	Less than. (See above.)
NE	Not equal to.
GE	Greater than or equal to.
LE	Less than or equal to.
-	To (expresses: from n to n).
ALL	To specify all values in a range.
Space	A blank character space; used as a separator in command expressions.
,	Comma. May be used as a separator.
;	Semicolon. Used to separate command expressions in macros and when stacking commands.
""	Restoration marks. Used to restore literal meaning of reserved words or symbols when used in a search term.
Nn	Proximity operator, where word order is not specified. N alone is used to indicate adjacency in any order. An integer (n) may be used to specify a number of intervening words.
Wn	Proximity operator, precise word order specified. W alone is used to indicate adjacency in exact word order specified in search statement. An integer (n) may be used to specify a number of intervening words.

PROBLEMS, ISSUES, AND PROSPECTS IN THE INTERNATIONAL ELECTRONIC EXCHANGE OF ALPHA-NUMERIC, PICTORIAL, AND GRAPHIC EDUCATIONAL INFORMATION RESOURCES

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This paper focuses on international electronic exchanges of information resources which both include and go beyond the scope of the common alpha-numeric materials. It deals primarily with the accelerated changes which have occurred, particularly in the past three years and are continuing to occur, in information creation, storage and retrieval, organization, indexation, transmission, translation, "publication", and/or display, and use, together with the concomitant rise on the expectations of information system end-users in the capabilities of such systems to provide them with interactive, integrated, "user-friendly", individualized services in the form of "all of the 'right' information and only the 'right' information, at the 'right' time and place, in the 'right' language and media/format, and at the 'right' cost, irrespective of when or where or by whom the information originated". Some of the significant exacerbations of the problems which arise when attempts are made at the international level to deal with such information are indicated. Trends and examples, technical and others, involved in efforts to overcome barriers to such exchanges, are noted, with a brief attempt made to forecast the prospects for the future success of these efforts. Speculation concerning some of the possible and more probable impacts of the forecasted events upon libraries and librarians, educational institutions and educators, and society at large is also ventured.

PROBLEMS, ISSUES, AND PROSPECTS IN THE INTERNATIONAL ELECTRONIC EXCHANGE OF ALPHA-NUMERIC, PICTORIAL, AND GRAPHIC EDUCATIONAL INFORMATION RESOURCES

Introduction

This paper has a number of closely related objectives. In essence, it comprises a "sequel" to, and a substantial revision and update of one authored a little over three years ago by the present writers (Goodman and Standera, 1983). Rapidly accelerating developments have rendered much of the specific technical material reported at that time virtually obsolete. Accordingly, the present paper will deal primarily with those key technological innovations which have increasingly made possible the interactive and integrated electronic generation, organization, editing, transmission, translation, and display of educational information resources. More particularly, it will discuss the current status of, and the new potentialities for electronic networking and for the exchange of the various combinations of alpha-numeric, pictorial, graphic, static and/or dynamic, single or mixed multi-media, live and/or recorded integrated educational resources primarily via international networks.

In addition, the paper will seek to indicate how attempts to apply these new technologies tend simultaneously to both ameliorate and exacerbate the pre-existing problems and barriers to progress in the field and also to enlarge and increase the seriousness of some issues raised, i.e., those involving administrative matters, financial concerns, standardization, information freedom and privacy, cultural autonomy, and so on. Some of the efforts being made to deal effectively with the newer facets of these topics will also be described. The final purpose of the paper is to speculate briefly on the probable nature of the potential impacts of the possible success of such co-operative networking endeavours upon educational institutions and libraries, upon their respective personnel, and upon society at large, especially with regard to "quality of life" considerations.

No attempt will be made to detail the history of the concatenation of events which still continues to spark efforts to establish automated multi-media educational resource-sharing systems and networks, including ones in which end-users might have interactive control, process control, and telecommunication capabilities. Suffice it to say that it was not until a number of technological breakthroughs had occurred and several intellectual/conceptual hurdles had been surmounted, that the practical realization of such notions could be attempted.

One such development was the greatly increased acceptance of the notion that the software and courseware of computers, together with the mixed multi-media materials available in domestic and foreign libraries, educational institutions, and research laboratories, comprise important and effective learning resources. Building on that conception, some information scientists, librarians, and educators have now become motivated to develop and refine relatively sophisticated, interactive, automatic electronic information processing and transmission networks for the sharing of these resources at various geographical levels, including those which are international in scope.

In view of their crucialty as regards the potential educational "worthwhileness" of the networks and resource exchanges in question and in view of their interrelatedness, two additional broad general categories of developments warrant brief mention here. The first is the conceptual synergism of a number of related notions. Perhaps the most important of the latter is the one now commonly referred to as the "'Right' or 'Appropriate' Information concept or construct". The acceptance and application of that concept and its tenets as an ethics-based code and an over-arching professional objective and an ideal for all information specialists, including librarians and educators, would make it incumbent upon them, insofar as possible, to provide their "clients"/students with user-friendly individualized information services in the form of "all of the 'right' (appropriate) information, and only the 'right' information, to all of the 'right' people and only the 'right' people, at the 'right' time and place, in the 'right' language and media/format, and at the 'right' cost, i.e., that which is affordable to the recipients, to the information/telecommunication system, and to the communities in which the recipients find themselves, irrespective of when or where or by whom the information originated." Obviously, in the satisfaction of user information needs via individualized information services, there will be variability in the 'rightness' of any given item of information for any given individual. And, in its educational context, user satisfaction is presumed to be dependent upon such personal traits as learning style preferences, sensory modality (media) preferences, and such individual characteristics as physical handicaps, etc. As well, satisfaction, particularly in the case of adult learners, is assumed to be closely linked to the degree to which the information provided appears, to a given user, to assist in the solution of his/her personal problems, and/or to cater his/her individual interests, be they economic, vocational, recreational, intellectual, or whatever. Probably even more crucial for adults, but also applying, to a degree, to students of all ages, in the view that the learning which will occur will be positively affected by the extent to which the student conceives of the learning process as being under his/her voluntary control, as regards such aspects of the process as the content being presented, its organization, its intellectual level, the pace at which it takes place, etc. Hence, in large measure, the success of any automated instruction/learning system is assumed to be dependent upon the capability of the system to have communicated to it, by the user, what that user deems requisite for his/her learning satisfaction, and in turn, for the system to be able to respond effectively and appropriately to those felt information needs. [1]

The second category of recent developments affecting the "worthwhileness" of automated educational networks is that which involves the emergence of complex integrated and conjoint information and telecommunication systems, ones which increasingly have the capacity to deal simultaneously with a variety of media formats; a variety of computer types and peripheral equipment; and a variety of means for accomplishing interactivity between the systems and their group and/or individual users (who may be located variously and quite remotely from each other and from the computer). Details concerning the general features and the specific component sub-systems of this new generation of information systems, and their actual and potential contributions to the types of exchanges of interest here, will be noted in the section of this paper which immediately follows the conclusion of these introductory remarks.

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[1] As the "'Right' Information construct" has been dealt with in some detail elsewhere (Goodman, 1978), it will not be further elaborated here.

Closely related to the foregoing advances are concurrent innovations in a number of academic subject matter fields, some of which are multidisciplinary in nature, including information science, computational linguistics, artificial intelligence, and cognitive psychology. These innovations make possible certain potentially useful applications, in learning environments, of the above-noted technological developments, and they considerably augment the nascent integrative and other capabilities of the information systems under discussion.

All of the foregoing recent developments have resulted in the rendering of educational resource exchange systems and networks ever more technologically feasible, and have concomitantly fostered approaches to the ideal postulated in the "'Right' Information construct".

These introductory remarks would be incomplete if mention were not made of two excellent recent publications, one involving a series of articles in the Journal of the American Society for Information Science, vol. 37, no. 4, July, 1986; and the second, a 1986 report produced in Brussels by AGB European Studies, entitled For Whom the Bell Tolls, with the sub-title Responses to Accelerating Change in International Communications. Taken together, they deal very adequately with the current "state of the art" and the probable near-future developments in the field of information and telecommunications. Both treat alpha-numeric, graphic, static, and pictorial information, to the virtual exclusion of other formats of information. It should nevertheless be noted that almost all of what is included in the two documents concerning the former formats applies with the same or even greater force to the international exchange of educational resources in multi-media formats.

Recent Technological Advances

The New "Teleinformatic" Systems

The past three or four years have witnessed more than the mere beginnings of a new generation of now combined information and telecommunication systems and networks. The resultant near "total" hybrid entities are frequently radically different from their separate predecessors in terms of their improved variety, comprehensiveness, and the range and novelty of the functions which they are able to perform. They are also considerably more automated and more integrated or articulated; they incorporate more precise and powerful means for "across the board" computerized/automated content processing involving natural language text, numeric text, and dynamic image processing; and, in consequence of the foregoing improvements, they are greatly enhanced in terms of the degree to which they are able to offer, on an almost global basis, virtually individualized information services, and also services which may involve conventional as well as multi-media formats and content. An example of a system which is well along the way to offering such integrated prowess can be found in the BASIS/DM (Data Management), a new version of a well-proven system, now in operation at the Battelle Columbus Laboratories, in Columbus, Ohio. In sum, these meta systems and networks are creating a new teleinformatic environment, one which it can be anticipated will have a very considerable impact upon the potentialities, if not the realities, of electronic interchanges of multi-media educational materials across national frontiers.

It should be noted that the overall competence of these systems and networks have been augmented, not so much by the full marriage of the two former almost separate information and telecommunication entities, as by the development and articulation of their respective major and minor sub-systems, including their related software. The sub-systems in question include: AM and FM stereo radio; broadcast and cable television (including slow-scan television, videotape production, recording, and playback facilities); video and compact discs with "read only memories" (ROM); photographic discs; optical laser memory cards; holographic systems; microcomputers and their various peripherals, both hardware and software; scanning systems; facsimile systems; electronic mail systems; electronic publishing systems; teleconferencing and telelecturing systems (including telephone, radio, satellite, television, computers, and various combinations thereof); electronic games and simulations; computer assisted instruction (CAI), or computer assisted learning (CAL), and computer managed instruction (CMI) systems; on-line information storage and retrieval systems; computerized microform systems; satellite and fibre optic transmission systems; and artificial intelligence (AI) applications, including expert/knowledge-based systems.

As the major new and/or improved competence referred to above consist primarily of extensive increases found in the functional capabilities of certain of the sub-systems, it would perhaps be well, at this point, to describe these improvements in somewhat more detail, insofar as they specifically relate to sub-systems for which educationally useful applications are beginning to occur or have already occurred, especially in those facets of the profession which involve automated and/or electronic individualized instruction, distance education, and/or the sharing of multi-media resources.

The New Electronic Telecommunication Systems and Networks

As parts of the new meta systems, telecommunication systems, at least in North America, have experienced tremendous recent changes, as evidenced by increases in their number, variety, speed, error-free operation, efficiency, and in their applications and uses. The extended novel applications have occurred largely for the purpose of improving electronic information interchanges, especially those in the form of information retrieval from on-line databases. This is accomplished by the use of more effective computerized local area networks (LANs) which typically interconnect a number of micros and/or workstations; by the use of national and international wide-area packet-switched networks; and by the use of "gateways" which effect the interconnections between the various networks and individual host computers.

The gateways offer uniform logon and logoff procedures, standard commands, directories, and additionally, make possible services such as resource-sharing not otherwise available. For example, materials in one network member's files may now be transferred to and downloaded by any other member. These gateway interconnections also permit educators and librarians to build their own personalized computer files (which can, for example, consist of sub-sets of the ERIC database); to store these files locally; to have them sorted; and also to have them displayed and/or printed on a shared printer. Similarly, major CAI programs, such as those available on the PLATO system, may be distributed and shared. A telefascimile device may also be part of the shared hardware.

In addition, the availability of multitudinous channels and bands of communication via new and extended fibre optic and satellite communication systems have made more feasible the electronic interactive integrated multi-media transmissions of educational materials.

Improvements in the technical quality of information transmission facilities include transmission via telephone lines. Telephone systems, with built-in error-deletion and/or error-correction facilities based on new communication protocols, are now capable of transmitting 2400 baud (approximately 240 characters) per second. This rapid, virtually errorfree transmission of information renders possible more realistic and almost dynamic visual as well as static-graphic and static-pictorial information.

An example of an arrangement designed to take combined advantage of many of the foregoing innovative capabilities of teleinformatic systems may be found in the development, by telecommunication companies in most of the technologically advanced countries, of national portions of what is to become a Universal Information Service (UIS). This Service is to take the form of the phased-in installation of nation-wide Integrated Services Digital Networks (ISDNs) which are designed to provide convenient access on the same network to all types of voice, text, data, and/or image services, using the aforementioned error-free high speed transmission facilities which are to be available at presumably reasonable costs to individual customers.

This achievement is made possible by digitization of the respective services. It is claimed that a national ISDN will be in operation in the U.S. by the early or mid-1990's. It will initially offer simultaneous voice and data communication services over a single line, with call forwarding, automatic callback, and message storing and forwarding capabilities, through the use of UIS terminals consisting initially of telephones, keyboards, and cathode ray tubes (TV screens). Its transmissions are expected to operate at 64 kilobits per second. It is anticipated that similar facilities will be available, before the end of the century, on a nearly global basis.

The New Teleconferencing, Telelecturing, Electronic Publishing, and Electronic Mail Services

Geographically extended and greatly improved facilities for various types of teleconferencing and telelecturing have recently become available in many countries. They include arrangements involving combinations, for local, national, and international networking, of two or more of the following technologies: radio, satellite, television, and computers. Some of the facilities are now capable of simultaneous voice, text, and/or graphic/pictorial communications. Many, including a few at the international level, have been designed and implemented for live and/or recorded educational information exchanges.

As well, corresponding strides have occurred in the past few years in the now vast realm of electronic publishing and the often complementary field of electronic mail services. As a result, it is now possible for authors and producers of a number of different types of educational materials to conduct the many interactive and other processes involved in the publication and distribution of their works via electronic means. They can commonly do so at great savings in time and money for all concerned. By the same token, professors can conduct joint research projects, including experimentation, in collaboration with distant colleagues by means of a combination of live and on-line teleconferencing and electronic mail facilities, possibly followed by co-authorship and text processing/editing, etc., by electronic means, of the resultant publication.

The New Generation of Microcomputers

Turning next to computers, more particularly, to microcomputers which constitute components of teleinformatic systems, one cannot help but note the gigantic leap forward that has been made in terms of their overall competence. This is especially true, in the educational milieu, in relation to microcomputers and their peripherals. The latest micros are commonly provided, in addition to virtually error-free operations, with almost all of the capabilities of minis and of "high-end" workstations; with memories on the order of one megabyte and above (Macintosh will have 4 MBytes when the one megabit chip is implemented); with processing speeds approaching one million instructions per second (MIPS); with extremely fast disc storage, amounting to tens of megabytes; with provision for the creation and display of multi-store high resolution graphics and almost dynamic pictorial features; and with windowed screen interface employing either a mouse or a menu. These microcomputer innovations are being accompanied by a wide range of new application hardware and very effective software and courseware components. The software may be used not only for wordprocessing and for further software and courseware development but also, increasingly, for controlling the presentation of, and for the networking of multi-media analogue or digitized information. Many of the micros additionally have built-in interface devices which enable them to be connected to, and to control the operation of other peripherals, such as compact and video discs. Moreover, some micros now have the capability of voice recognition; some can be controlled by voice activation; a few are able, by means of built-in synthetic speech mechanisms, to query their users in natural language, and even to provide spoken responses to their users' queries, with such queries and responses being pre-recorded or ad hoc in nature. Claims are also being made to the effect that some prototype micros are in the process of being enabled to engage in "learning by experience".

These novel features and improvements have resulted in correspondingly large increments in the user-friendliness (transparency) of man-machine and machine-machine interfaces, a feature which is particularly important in information system design for use in educational undertakings, including those involved in international resource exchanges.

The New Computerized Information Storage and Retrieval Systems

In the past few years, computerized/automated information storage and retrieval systems have undergone transformations resulting in sizeable gains in their performance capabilities. These systems may now be accessed either locally or remotely (e.g., internationally), and either serially or randomly. They have experienced exponential growth in their "full-text" information storage capacity; in the density of their use of the available storage space; in the types of media formats which they are capable of storing and retrieving; and in the speed at which they can perform both storage and retrieval functions. Their various types now include, in addition to magnetic tapes, microforms, video discs, photographic discs, laser memory cards, and compact optical discs with ROM, and within a year or so there will be interactive compact optical discs - CD-I's. Additionally, when compared with their predecessors, some types of new disc memories will make possible greatly improved pictorial resolution for their visual inputs and outputs. These new optical/laser-based mass storage video and compact disc technologies permit the storage of far greater volumes of digital information, including multi-media information, per unit of given size, than were possible in the magnetic systems.

The new optical discs also offer a vast potential for expandability, as well as a tremendous savings in maintenance costs. Moreover, the drivers for these devices can now be connected to micros at a cost that is expected to be no higher than that of the hard disc drivers presently available.

The major deficiency vis a vis magnetic memories of the optical storage media, that of being non-erasable, apparently has been overcome in Japan, where it is claimed that video and compact discs with both erasable "read" and "write" memories have been demonstrated.

In the U.S., photographic read-only-memory audio-discs have very recently been produced experimentally and also demonstrated. They provide a much higher storage density than optical discs, in that the information on the former can be "packed in" much more closely than in the latter. The new photographic discs are also purported to be much more easily mastered, and once their content has been placed on masters, they can also be more readily copied. In addition, like the optical discs, their contents can be electronically digitized and transmitted from place to place, and then presented on either TV sets or the visual portion only displayed on conventional motion picture/slide projection screens. Their contents are randomly accessible and their visual quality is said to be that of colour photographs, with the resultant images being extremely realistic.

The New Artificial Intelligence (AI) and Computerized Automated Natural Language Processing (NLP) Systems

To conclude this section on technological advances, we turn, finally, to a discussion of AI, that broad area of computer science concerned with enabling computers and their programs to simulate the thought processes of humans, and its offshoot, NPL, that integral component of high level AI applications which deals with the various computer-bases approaches to the handling of unrestricted written/printed and/or spoken language. In essence, the competence of all of the previously noted relevant developments in teleinformatic technologies, from the new electronic telecommunication systems and networks to the new computerized information storage and retrieval systems, have been greatly enhanced by AI and NLP. This is especially true as regards the applications which involve expert/knowledge/based systems, i.e., those systems which employ refined procedures for mimicking the thought processes of technical and/or professional personnel. Unfortunately, the achievement of credible, efficient, useful, and very sophisticated types of automated NPL, such as those involved in expert systems, is still feasible only in very narrow and well-defined subject matter areas, such as the natural sciences and medicine. In an effort which combines the skills of colleagues from several disciplines, AI and NPL specialists are beginning to develop the first generation of software and courseware that is planned to eventuate in the production of expert systems in the humanities and social sciences, including education, and perhaps ultimately, in the production by computers themselves of effective individualized educational materials.

NPL has, in its increasingly highly automated forms, been prominently involved in the development of both machine language translation and computer assisted language translation systems, as well as automated indexing and abstracting systems. The eventual availability of machine translation will make more practicable wide scale international interchanges of educational resources which involve translations of written language and/or speech. Machine assisted translation facilities are already in use, though perhaps not as yet in education, and some limited progress has been made towards automatic translation itself.

Applications of NPL include, as well, uses in integrated language text, numeric text, graphic systems, and pictorial systems such as dynamic image processing. Another of its salient characteristics is its ability to incorporate user queries, responses, and feedback in user-machine on-line interactions, such as automatic search strategy initiation and modification. In its most advanced forms, NPL is attempting to encompass "intelligent" analysis and understanding, as well as the provision of software for what are still the embryonic areas of machine learning and the expression of meaning by computers.

With the valuable assistance imparted by AI and NPL, the eventual development of user-friendly "intelligent front ends" for microcomputers will, in a sense, represent the culmination of all of the efforts exerted towards automated individualized information services and materials. One very important step in the development of such user-friendly systems may be seen in the considerable advances made in the automation of the characterization of individual information system end-users. The increasingly computerized process of producing individual user/learner profiles via user-computer interactions which are facilitated by expert/knowledge-based systems and cognitive psychology-based query software now make considerably more possible the fulfillment of individual user information desires and needs. Increasingly, too, such systems can be based on various individual traits, such as user interests, experience, ability, etc., which, when taken into consideration, should make a positive difference in the knowledge background and/or quality of learning of said users.

So much, then, for the new generation of information and telecommunication systems and networks and the capabilities of the totality of their various subsystems and applications. Together and on the whole, they have tended to greatly increase the possibilities of international, interactive, electronic educational resource-sharing. And, in turn, they have assisted in bringing about ever-more-close approaches to the goal embodied in the "Right' Information concept" and in the eventual transformation of the ideal of comprehensive individualized teleinformatic services from the realm of idle dreams into concrete reality.

The Problems, Issues, and Impediments Confronting the International Interchanges of Electronic Multi-Media Educational Materials

In the past, educators librarians, information scientists, and others who sought to bring about international electronic interchanges of multi-media educational materials were faced with major problems and issues, many of which were technologically oriented. Despite the numerous technical breakthroughs which have occurred, this situation still persists. In varying degrees of severity, the problems and issues in question continue to cause the actual large scale practical implementation of such interchanges to be far less prevalent and successful than their apparent educational worthwhileness would seem to warrant. Especially in the sphere of international cooperation, the difficulties seem to have taken on a new order of magnitude. In general, the obstacles which have arisen, or are likely to arise, concerning these interchanges span the gamut of virtually all the problems and issues with which mankind has been afflicted in relation to the new technologies. They will be discussed very briefly, along with a few representative examples, under the broad yet closely related categories of: technological and terminological; economic and financial; political and legal; psychological, intellectual, social, ethical, and human resource-related.

Many of the aforesaid difficulties will doubtless be solved with the passage of time; some will possibly be replaced by ones of a more complex and serious nature; and some, especially those involving human interactions, will probably remain relatively intractable. Many, particularly those of a technological nature, would appear to be partly avoidable, or more readily solvable, through careful and appropriate teleinformatic system and network advance planning.

At the heart of most the aforementioned matters requiring solution is, first, the determination of the educational needs and objectives to be served, and then, the appropriate selection and alignment of the various component technologies required to meet those needs and objectives, bearing in mind that the networks and the technologies utilized serve only as a means for the achievement of the desired educational ends.

The Technological and Terminological Problems and Issues

Among the most pronounced of the technological problems for which solutions remain to be found are those which stem from difficulties which arise in connection with the establishment of widely agreed upon standards and the closely related problems of overcoming various component hardware and software incompatibilities. The variety, multiplicity, and complexity of the different information and telecommunication systems and networks, together with the rapid changes which are occurring in all types of hardware and software, make the obtaining of widespread agreement on standards extremely difficult to achieve.

Even national standards take years to be developed and the implementation of these standards, at least in the Western democracies, cannot be imposed. Hence the enormous range of incompatibilities, not only with regard to equipment, and the materials used in that equipment, but also among different nations and within nations. As an example, one might note that the national and international networking strategies employed by many PTT's are often designed to support what currently exists in each country and to resist changes. These restrictive practices, coupled with increasingly complex demands on the overburdened, underfinanced, and outdated PTT facilities, result in serious telecommunication problems and in the impeding of progress in the acceptance and implementation of new international standards designed to reduce or eliminate incompatibilities and to facilitate all types of information exchanges.

The consequence of these strategies are well illustrated by the fate of the attempted change-over from the present broad band analogue practices to the new digitized narrow band technologies. The new ISDN standards which are to be based on the latter, and which are presumably to be internationally proclaimed in 1988, and then implemented, will have taken some twelve years to achieve their final status. Until the implementation of these standards is accomplished, we will be in the midst of concurrent divergent and convergent preparations for the change-over. The incompatibilities which stem from the former relatively non-standardized situation will temporarily become even more severe during this period. The fact that the extant systems tend to be incapable of providing, simultaneously, various combinations of alpha-numeric, graphic, and static or dynamic pictorial information, whereas full compliance with the new ISDN standards will require equipment and software capable of the simultaneous performance of all of these functions, is amply indicative of the enormity of the incompatibility problems which will have to be faced during the interim period. In the meantime, the reconciliation of such incompatibilities will increasingly become an almost intolerable technological and financial burden for many of the national information and telecommunication systems and networks and, in turn, for educational institutions and libraries. Unfortunately, by 1988, the to-be implemented ISDN standards are likely to be largely outdated, and hence, it would appear that the change-over period will have to be extended indefinitely, to accommodate new technologies as they come into existence. The achievement of a process whereby appropriate standards may be implemented without the stifling of innovation and further progress will thus continue to be an on-going problem.

Apart from the standardization and compatibility problems noted above, there is a further major area of difficulty in the technological realm. Serious bottlenecks occur in multi-media resource networking as a result of the still limited memory storage capacity of the microcomputers in use in most educational institutions. Currently, that capacity tends to be too small to both store or download sizeable databases containing multi-media materials and also to control the storage, retrieval, and transmission functions of integrated networks. Fortunately. it appears to be simply a matter of time until the foregoing memory capacity limitation problems are solved. Solutions may well be forthcoming by the time of the reading of this paper.

Yet another serious difficulty of a technical nature and one which has persistently plagued information-telecommunication systems and networks for many years is that of the centralization versus the decentralization of services. Each time new technologies enter the scene, the issue comes to the forefront once again. An example may be seen in the fact that the Ministers of Communication from thirty countries who assembled this summer in Vancouver, Canada, were told, by Alfred Sikes, Assistant Secretary for Communication and Information, U.S. Department of

Commerce, that centralized authority can impede rather than facilitate the development of a national communication system. He claimed that monolithic monopolies in telecommunications, characterized by central planning, are harmful to progress in these systems. However true this may be, there is an opposite point of view, which holds that the divestiture by national governments of powers by their respective telecommunication authorities all too often results in a multiplicity of competing types of hardware and software which are commonly incompatible. Nevertheless, in the U.S., where divestiture has become the rule, the supporters of that process maintain that as a result, the U.S. has put in place by far the world's best teleinformatic structure.

The last matter to be raised under the rubric of technological problems and issues is that of the difficulties that result from the existence of a terminological "Tower of Babel" in the fields under discussion. In this case, the problem is not merely one of a technical nature but also involves intellectual and psychological ramifications with respect to the development of effective interchangeable educational resources. The terminological morass stems, in large part, from the requisite confluence of the functions of the many specialized disciplines and technologies that comprise the new domain of teleinformatics. Each of the disciplines and each of the new technologies being eclectically integrated into the teleinformatic systems has its own set of terminology. The novelty of the component technologies, together with the novelty of the new conjoint one, along with the various jargons, result in a state of considerable confusion. Moreover, manufacturers of the component parts of the newly integrated "whole" systems still also tend to employ their own copyrighted terms. The resulting highly ambiguous situation severly hinders the possibility of cooperative endeavours which are requisite to the local, national, and international preparation and distribution of multi-media materials.

The Economic and Financial Problems and Issues

In addition to the economic problems and issues alluded to earlier, there is a basic financial one which confronts would-be multi-media educational resource networks. It results from the fact that, as soon as one seeks to provide a network, at any level from local to international, with the capability of dealing interactively with mixed multi-media materials, the cost of the system immediately escalates.

Moreover, because most of the multi-media technologies in question are still in their infancy their development costs remain very high, and when they are integrated with micros in newly developed networks, the total cost, even when shared, becomes unaffordable to educational institutions. For example, a mini and micro combination which could serve as basic components of a "two-way" teleconferencing/tele-educational videotex network, with both audio and graphic functions, would involve such additional equipment items as: a "meet-me bridge" ($75.000 Canadian); special microphones; videotex terminal equipment, and at least two colour TV sets/monitors. Additionally, in North America, most educational-institution colour TV sets have screens which are approximately 61 centimetres in size diagonally, or smaller. When such screens are used for television purposes, for videotex purposes or for graphs with text, by more than five students, they are unlikely to be satisfactory, in that the students would probably not be able to read the textual matter unless very large letters were used. In the latter case, the amount of text appearing on each "page" or "frame" would have to be decreased, the time taken for the presentation would have to be correspondingly increased, and the instructional value of the presentation might well be lessened thereby. And, although large TV screen projectors are available, they are still far too expensive ($3.000 Canadian or more) for regular classroom use, even in those countries which are well-endowed, financially.

Then too, the great majority of micros currently in use in educational settings are still able to deal only with alpha-numeric characters, and have limited graphic capabilities. They also tend to have only a limited ability to present either dynamic or multi-coloured materials, and most cannot be readily interconnected with regular colour TV sets or monitors. Even when RF modulators are at hand, the quality of the picture tends to be educationally inadequate. The cost of upgrading this equipment, to enable it to perform the additional functions, or the cost of replacing it in quantity, would be unmanageable for most schools, and even for most universities.

The Political and Legal Problems

Because the control of computerized educational networks commonly rests in the hands of end-users (mainly teachers and students), rather than information system personnel, the political and legal problems which arise in connection with their inception and operation may become very complex. As well, end-users may be relatively naive concerning copyright and other legalities related to the use of materials presented on a network, and as they may be similarly comparatively innocent concerning, say, the political implications of using resource materials created in political jurisdictions different from their own, serious difficulties may arise for all concerned. These problems may in part stem from the fact that the legal aspects of the use of various types of multi-media materials may vary considerably, not only from one political jurisdiction to another but also from one media format to another.

With the advent of the new ISDN system and network, a whole new set of legal entanglements will inevitably emerge. In the case of the present dial-direct long distance telephone systems involving two or more nations, the arrangements regarding toll charges are legally and economically relatively simple, as compared with those involved in the operation of future networks via various gateways. International agreements and revenue-sharing settlements involving a quite new set of arrangements will be required. Political considerations will be involved as well, in that governments will continue to want to monitor trans-border data flows for security and other reasons. The monitoring and/or censoring of the international flow of multi-media materials will involve a whole new order of magnitude of legal and political problems for nations, both internally and externally. For example, the on-line importation of foreign-produced resource materials could involve problems concerning possible violations of foreign exchange controls which exist in many countries.

A few further points related to the legal aspects of teleinformatic systems and networks will be dealt with in the sub-section of this paper which follows.

The Psychological, Intellectual, Social, Ethical, and Human Resource-Related Problems and Issues

The availability of computers, especially micros, to the general public, to libraries, and particularly to educators and students, and the networking of educational materials through the use of computers, gives rise to a host of problems which span almost the entire range of philosophical, ethical, intellectual, and social relationships. If, for example, only the children of well-to-do families have access to micros, both at home and in school libraries and classrooms, while all the other must do without such access, there will be an inevitable information and knowledge gap between the rich and the poor. The development of an intellectual elite could well be one result of such a gap, with the gap extending to a hiatus between the knowledge-rich and the knowledge-poor among nations, with all of the resultant implicit potentialities for increased international misunderstanding and strife.

At a more personal and individual level, the provision of automated individualized educational information services would, as alluded to earlier, require computers to contain within their memories personal information concerning individual learners - their learning styles, their intellectual levels, the state of their health, etc. Insofar as it is still difficult to provide privacy safeguards economically and almost impossible to do so in a fool-proof manner, in such computer networks, the problem remains a challenging one.

Then too, high-level interactivity capabilities are assumed to be a desirable characteristic of an educational network. Opportunities for students to engage in programming the computer are also generally deemed to be valuable learning experiences. As well, such opportunities may assist students in their self-determination of the content and other aspects of the learning process. However, these possibilities may leave the way open for students to modify, possibly irretrievably, instructional programs prepared by teachers, and also possibly permit them to gain access to, and tamper with, academic records. The provision of security measures to prevent such undesirable alterations to stored information is both timeconsuming and costly. Moreover, in many countries today, copyright matters, patent rights, and issues such as intellectual privacy, etc., still continue to be in a virtual state of legal/constitutional flux and/or almost complete confusion, even among the experts. Also, the fact that end-users, who may not have appropriate security clearance, may be able to gain direct access, through their micros, to information to which their entitlement may be questionable, could put unbearable strains upon network owners and/or operators. The possibility of "building-in" security checks and/or encryption mechanisms, while it exists, would doubtless seriously encumber the operation of the networks, and is also presently very expensive.

Many educators regard print-out capabilities to be an indispensable feature of computers and networks which are used for educational purposes. This capability, along with the fact that many of the multi-media technologies provide their users with the possibility of reproducing or replicating information distributed to them via computer networks, can result in plagiarism and the violation of the intellectual rights of the creators of learning materials. Microcomputers, in combination with print-out facilities and/or videotape recording devices, can also be used to modify educational materials sufficiently to circumvent copyrights. Hence the temptation to do so is great, and the successful policing of such violations is an almost impossible task.

Unfortunately, it is quite possible, if not highly probable, that many aspects of the above-noted undesirable situations will deteriorate still further, before they improve.

Personnel and human relations problems may readily surface in connection with certain important educational uses of computers, particularly when the diverse group of experts required to prepare and present effective instructional materials seeks to engage in a collaborative effort. These specialists, for example, may not be in the habit of collaborating with others, even within their own disciplines, let alone with people in other areas of expertise, and none may have an overall view of what is required. Some of the specialists may also lack familiarity with major components of multi-media computerized networks. Fortunately, however, this latter difficulty is likely to be a temporary one.

Another personnel problem stems from the fact that few educational systems have trained information intermediaries who can operate a multi-media microcomputer-based network so as to make it sufficiently user-friendly as to enable teachers and students to use network successfully and efficiently. Yet the presently still complicated nature of the processes and procedures involved make it impossible to conduct these exchanges without the presence of such trained information/communication specialists. Here too, fortunately, the difficulty in question is likely to be a temporary one.

Conclusion - Trends, Impacts, Prospects, and New Roles

In essence, the trends observed three years ago have continued apace, and are predicted to persist much along the same lines. It is again not difficult to forecast that rapid progress will occur in overcoming some of the current technological problems, and that the possibilities of electronic resource-sharing will be affected, directly or indirectly, more favourable than unfavourably, by the numerous advances to come.

Once the major drawback of the various memory discs has been eliminated, then applications involving the production of fewer then 1000 copies of particular discs will become economically feasible and single or small sets of erasable discs will be able to store databases containing multi-media materials, such as those now contained on video tapes and motion picture film. The erasable disc could also be valuable for certain computer applications, such as that of serving as a replacement for the newer magnetic midget compact models. However, these discs could readily be tampered with and hence their use will have some limitations. The marriage of these mass storage facilities with the new generation of micros will render possible both local and remote storage and retrieval of the contents of multi-media encyclopedias, atlases, large reference manuals, illustrated training manuals, and so on. In turn, the entire contents of the discs will be readily and economically electronically transmittable, on a word-wide basis. Moreover, if it is deemed desirable to avoid having to contend with problems inherent in interchanges via telecommunications, the discs could easily be transported from place to place and from country to country, without encountering compatibility problems, assuming that the standardization now underway will be successful.

In the longer term, the new information systems will be able to engage in the uploading, downloading, and offloading of information in all media formats, again without incompatibility problems. When information of interest to a particular user is found in any location within the international educational resource-sharing system, it will be possible to make it available for local presentation, manipulation, reproduction, and/or long-term storage; automatic expert assistance will be available as needed, in order for said user to be able to make use of the information creation, storage, and retrieval capabilities of the system. For example, the user will be aided by the system in the formulation of queries, in the downloading of information, and in analyzing and using it, as well as in producing it in hard copy or on disc, etc. In sum, the user, with the assistance of the sophisticated software, will be enabled not only to interact with both the teleinformatic system and with other users, but also to "massage" information in a manner amounting to the creation of new versions of software and courseware.

If we turn next to the many non-technical barriers to said exchanges, it is apparent that they are still present in full force. The reduction and elimination of hurdles in the non-technical domain, including those in libraries and in education, will doubtless continue to occur more slowly than in the technical realm. In turn, it is likely that technological-application opportunities will be missed, or else modified to suit the pace at which institutional changes tend to occur.

In consequence of the foregoing, and despite the apparent acceptance, among numerous information scientists, including educators and librarians, of the value of international multi-media interchanges, these exchanges, in practice and with few exceptions are still at a relative standstill. For example, the number of static, picture-oriented databases is still minimal at this time, even in North America, and those which incorporate dynamic pictorial characteristics are scarcer still.

Although the present and probable future development in processing multi-media materials are likely to provide many future user benefits, at the moment, only a few practical applications have occurred which directly relate to increased possibilities for such interchanges. Although the grounds for optimism in these matters would thus appear to be rather meagre, it is the view of the present authors that there can be little doubt that increasingly successful attempts to establish such international resource-exchange mechanisms capable of dealing with all varieties of media formats will take place and that the practical reality will ultimately catch up with the promises and hopes of the present. Few though they now are, such educational interchange systems are sufficiently well-advanced to warrant attempts to extrapolate current trends and to try to gauge the probable impacts of these networks upon education upon libraries and upon society at large.

As the many different professional specialists accommodate themselves to working cooperatively in the new interdisciplinary milieu that will typify the teleinformatic age, a new combined natural science-social science-humanities meta-discipline will eventually almost inevitably emerge, along with new infrastructures involving alternatives to the present type of relations which pertain among the libraries, the educational institutions, and the networks and systems. The preparation of children and professionals to enter and work in this new environment will, of course, directly impact upon schools, universities, and libraries. Already discernible influences include the beginning of slow but profound changes in several aspects of education - in the content of what is taught; in the methodologies used; in the institutional structures; and in the roles of teachers and librarians.

The new educational systems are already assisting students of all ages in learning, via computer and telecommunication facilities, how to improve their study habits, their planning capabilities, and hopefully their ability to make efficient and wise decisions. Students are also engaging in these learning processes at home and at work, in libraries and in schools, or wherever, and with and/or without the continual physical presence of and interaction with human instructors. Such educational innovations are bound to seriously transform several vital societal roles - those of schools, of teachers, of librarians, and even of parents in the home. Teachers and librarians will probably function, in the future, more so than at present, as facilitators of student self-learning, through the judicious preparation and use of learning recources, ones which will commonly provide "custom-tailored" learning experiences for their students. Perhaps in part as a result of the new forms of education and the new decision-making capabilities derived therefrom, it will eventually be possible for mankind to deal effectively with the still unsolved problem of human warfare, and with the need to prevent or minimize the disruptions in societal functioning and in personal satisfactions which currently result from too rapid and too frequent or continuous change, especially in matters concerning basic values. And, at another level, perhaps, too, the increasingly heavy intellectual burden of information overload which already weighs down millions of individuals will begin to be shed.

To conclude, it is perhaps worthwhile, at this point, to repeat, with scant modification, a few of the remarks contained in the closing passages of the original paper of three years ago. They state that at least in the more technologically advanced nations, it has now become potentially possible for automated electronic interactive educational multi-media information networks and systems to convey, with increasing comprehensiveness, comprehensibility, efficiency, and economy, and with appropriate selectivity, to the world of users, not only much of the vast accumulation of mankind's knowledge, his wisdom, and his cultural heritage, but also the flood of newly created knowledge. It may well be that whatever their eventual integrated combination of functions may encompass, the teleinformatic networks of the future will be conceived of as but parts of a total, world-wide, individual user-oriented integrated network and system. If and when this comes to pass, perhaps the "World Encyclopedia" notions of the pioneer Czech educator, J.A. Comenius, and the "World Brain" concept of the prescient H.G. Wells, will be well advanced towards their realization.

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"Test run of a network of library- and information systems"

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"Test run of a network of library- and information systems"

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The paper sums up the results of a project carried out at BRODD - department of consultancy and research at the Norwegian School of Library and Information Science. The project was called "the trial run of a network of information systems" and was carried out between March and November 1985.

The systems involved were: BIBSYS - a large system with housekeeping functions, Micropolydoc - a microcomputer-based information retrieval system used for cataloguing and UBO:BOK - an information system at the Oslo University Library used for cataloguing, bibliographic retrieval and printing of different catalogue products.

BIBSYS is run on an Univac 1100 mainframe placed in Trondheim, Norway, UBO:BOK is run on a mainframe DEC-10 placed in Oslo, Norway. Micropolydoc/BIBNETT has been implemented on three IBM-PC/XT micro computers - one placed at the Swedish School of Librarianship at Boraas, Sweden, the second placed at the Norwegian Centre of Informatics in Oslo and the third placed in BRODD.

All three systems used BIBNETT application protocol for bibliographic search and bibliographic data transfer. The communication links used were the packet-switching public networks in Norway and Sweden, as well as the value-added university network (based on the public packet-switching network) in Norway.

The project proved that:
- the communication between different library systems is wholly feasible and functions satisfactorily when the communication network functions
- the public packet-switching networks in Norway and Sweden are quite stable but the services offered are too few; a value-added network seems to be a better solution
- the error-handling procedures in BIBNETT modules should be improved.

"Test run of a network of library- and information systems"

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1 GENERAL ABOUT THE "TEST RUN" PROJECT

The project is a follow up of two earlier projects carried out at BRODD (Dep. of Consultancy & Research at the Norwegian School of Library and Information Science). The projects went under the name BIBNETT and BIBNETT 2. BIBNETT had been carried out in the time period spanning from 1980 to 1982. The main goal of BIBNETT was to clarify whether a system-to-system communication between different library systems is technically and economically possible in Norway. The project concluded that "independently developed library systems using different types of DBMS, having totally different user dialogues and running on different types of computers can communicate via a computer network." 1

The computer network should be based on the ISO OSI (Open Systems Interconnection) network model. The 7-layer model includes an application (7th) layer where all protocols concerning communication of applications (programs) are placed. Such an application protocol for bibliographic search has been developed by the BIBNETT-project group.

The BIBNETT 2 project was based on the results of BIBNETT. The project was carried out in 1983 and 1984.

The goal of this project was to clarify and try out, for the first, if the library systems communicating are able to carry out complicated dialogues, for the second, if micro computer based library systems can communicate with library systems run on mainframes, for the third, if a system will be able to send data automatically to a union catalogue and also what kind of problems may be connected with multicasting-sessions.

The results brought about by BIBNETT 2 show that the systems can communicate according to the rules defined in the application protocol, but to carry out really sophisticated dialogues they will be depending on better services provided by the computer network. Especially the program-to-program service has been missed.

Furthermore, it turned out that a good and reliable network-management is necessary for the system-to-system communication to perform satisfactorily.

During the BIBNETT2 project several modifications and expansions were worked out for the application protocol. The expansions included, among others, messages for record transfer and updating of union catalogues.

The BIBNETT 2 project was supposed to include a test run period for testing the implementations of the protocol done on micro-computers and mainframes. Unfortunately, it was impossible to carry out this test phase within the resource-frame assigned to the project.

Thus, the test-run project had been suggested in order to carry out a comprehensive test of BIBNETT communication model between library systems running on different types of computers in different Nordic countries. The computer networks to be used in the project were:

DATAPAK - an X.25 (packet-switched) network offered by the Norwegian PTT.

UNINETT - an OSI-based university network in Norway.
Not all of the OSI-model layers are implemented in this network.

SUNET - an OSI-based university network in Sweden, using the Swedish DATAPAK-service.

There is a gateway between UNINETT and SUNET.

The project was carried out by a working group which was mainly based in Norway. In addition to that, a user group was established, whose task it was to carry out the actual tests. The user group was mainly based in Sweden, at the Swedish School of Librarianship in Borüs. Also a third group was established - called the observer group. This group consisted of representatives from different library-related institutions from four different Nordic countries: Sweden, Denmark, Iceland and Finland. The time span covered by the project was 9 months, from January 1985 to September 1985.

2. THE GENERAL IDEA OF THE PROJECT; THE DISCRIPTION OF THE LIBRARY/INFORMATION SYSTEMS INVOLVED

In the course of the BIBNETT and BIBNETT 2 projects implementations of the application protocol have been done in different library systems, mainly in Norway. Several factors contributed to the fact that it had been impossible to implement "general" BIBNETT modules, which would be able to build and interpret all kinds of messages defined in the application protocol. In addition to that, the computer networks used for carrying messages did not support services expected from layer 5 and 6 in the OSI-model. Therefore, it was necessary to build special "communication modules" in addition to special BIBNETT-modules. There were two types of BIBNETT-modules: the "originating system" and the "target system". These two kinds could build and interpret only a subset of the messages defined in the protocol.

The originating system and the target system modules were further developed and corrected during the test run project. It turned out that different programmers participating in the earlier projects, though they were cooperating, had interpreted the protocol in quite different ways. This resulted in implementations which not always were compatible with each other. Thus, the project stressed the importance of defining an absolutely unambiguous protocol which would not leave any doubt about how to interpret and implement the messages.

The library- and information systems where the implementation of the BIBNETT-protocol was done had quite a different character.

BIBSYS - the library "inhouse" system of the
         University Library in Trondheim, Norway,

is an integrated library system comprising such functions as

- cataloguing
- acquisitions
- bibliographic search
- loans

The last development was a kind of public catalogue incorporated in the system. The module permits a subject search.

BIBSYS runs on an Univac 1100 mainframe at the computer centre of the University of Trondheim. Records in BIBSYS are stored in an hierarchical database system and they are coded in MARC-format. In addition to the main database a little test database had been created. This database had been used under the development and initial testing of BIBNETT-modules.

It was the acquisitions module of BIBSYS which was used in BIBNETT- and Test Run projects. The BIBNETT-projects had had access to the test database while the Test Run project had access to the real database.

One may use following search keys in the acquisitions module of BIBSYS:

-author
-title
-ISBN/ISSN,LC-number,national bibliography number
-Dewey classification code.

UBO:BOK is an information system developed and maintained at the University Library in Oslo. The system consists of a cataloguing module and a search module which is open for the public. The records are stored in a file system supported by the DEC-10 mainframe on which the system is run. The records are in full MARC-format. There are several different bases accessible in the system. The Test Run project had access to all of them.

The search keys in the UBO:BOK system are:

-author
-title
-words from title

- series title
- Dewey code
- ISBN and national bibliography number

Search keys can be combined with boolean operators AND, OR,NOT. Maximum two keys can be combined at one time.

MIKROPOLYDOC is a commercial information retrieval system developed and marketed by the Norwegian Centre of Informatics (NSI). It is a micro computer version of the POLYDOC IR-system available on several mainframes and minicomputers. MIKROPOLYDOC can be run on most CP/M or MS-DOS based micro computers, an UNIX-version is under development. Records are stored in a database consisting of inverted files and a document file. All the records in one database must be of the same type. The system does not support MARC-format directly, but converting programs are available. A record in MIKROPOLYDOC may consist of no more than 20 fields. Fields are of variable length and may be divided in subfields. All the fields may be searched, either by free text words or by subfield-keys. Search keys can be combined with boolean operators AND, OR, NOT. A prefix of two-letter field code must be given for all search keys, exclusive the default search key and a set-number.

The MIKROPOLYDOC implementation which was mainly used in the Test Run project was placed on an IBM-PC/XT micro computer at the Swedish School of Librarianship in Borüs.

The database defined allowed, among others, following search keys:

-author
-title
-words from title
-ISBN
-Dewey classification code

3. ORGANIZATION OF THE PROJECT; PRACTICAL EXPERIENCES

Three different systems were involved in the project. They had to have access to a computer network in at least two Nordic countries. The Norwegian UNINETT and the Swedish SUNET were initially chosen for the project.

The systems' access mechanism to the network was as follows:

BIBSYS is run on a host computer in UNINETT. Layers 1-4 in the network were placed in a UNINETT-node, a KS-500 Norwegian made computer. Both in the UNINETT-node and in the host computer special modules were implemented to support the program-to-program service enabling BIBSYS to communicate with UNINETT-programs.

MIKROPOLYDOC had to be expanded with a special communication module designed to enable the IR-system to communicate with a computer network. The micro computer with this special MIKROPOLYDOC implementation was supposed to be placed in an institution which had access to the SUNET, but this proved to be too costly and the system was eventually placed at the School of Librarianship in Borüs, which had access to the public network.

UBO:BOK runs on a host computer in UNINETT. Layers 1-4 in the network were placed in an UNINETT node, a ND-100 Norwegian made minicomputer. A special communication module was implemented in the UNINETT node, to enable the UBO:BOK system on the DEC-10 mainframe to communicate with UNINETT-programs.

The "Searching Schema" for the participating systems was planned as follows:

-users of BIBSYS were supposed to search in UBO:BOK bases
-users of UBO:BOK were supposed to search in BIBSYS
-users of MIKROPOLYDOC were supposed to search in BIBSYS and UBO:BOK bases

Because of technical difficulties it was not possible to call up MIKROPOLYDOC from the other systems.

It was not only searching others' bases which was to be tested in the project. Also, record transfer to own databases and automatic updating of union catalogues were to be tried out during the communication sessions.
All the three systems were supposed to transfer records to own databases. The transfer was always to include records in MARC-format. BIBSYS and UBO:BOK were able to store such records directly in their databases. In MIKROPOLYDOC it was not so easy, as the system does not support MARC-format, and besides, it has batch-oriented updating routines. The records must then be stored in a temporary file, and a conversion program must be run in order to incorporate the records in the database.

As for updating of union catalogues, BIBSYS and MIKROPOLYDOC were to send records to union catalogue base (Samkatalogen) available through UBO:BOK.

In addition to the above mentioned tasks, it was also desirable to test how the computer networks perform when used for this type of communication. The project was to clarify whether the gateway between UNINETT and SUNET could be a bottleneck, whether the network can cause delays in establishing a communication link between systems, and whether there will be many breakdowns of communication sessions due to a malfunction of the network.

Practical experiences from the project

Network connection to BIBSYS did function well until a disk package was destroyed on the UNINETT-node. This made BIBSYS not longer available in the network. Network connection from BIBSYS did not function well most of the time. The special communication module in the UNINETT-node had several bugs and this caused that communication links were quite unstable or down most of the time.

Network connections from MIKROPOLYDOC functioned very well all the time, both when using Norwegian DATAPAK and Swedish DATAPAK. However, these networks can handle only the three first layers in the OSI model. This caused that errorhandling was not good enough when a little breakdown happened somewhere in the network. A session between library systems broke down completely as a result of that.

It did happen that the public network was not available because of huge traffic, but that was rather seldom.

Network connections to UBO:BOK functioned very well during the whole project. Problems with establishing a communication link were sometimes caused by overload on the computer or by a breakdown of the computer.

It turned out that it was not possible to establish a network connection from UBO:BOK. The modules used once in BIBNETT were not operating, and an X.25 node connected to the DEC-10 was not available for the project because of lacking accounting programs.

Most of the searching sessions were initiated from MIKROPOLYDOC in Sweden. Some sessions were initiated from BIBSYS and some from MIKROPOLYDOC installations in Norway (BRODD and NSI). No sessions were initiated from UBO:BOK.

Several different commands were used during the searching sessions. Quite complicated searches were carried out, with use of truncation or without. The sessions could include choice of database, search of database with several different keys, browsing in search sets and record transfer. A large number of MARC-records had been transferred from BIBSYS and UBO:BOK to MIKROPOLYDOC. These records were stored in separate files and it was possible for the user to browse immediately in these files.

It was not possible for any of the systems to carry out updating sessions with the union catalogue in UBO:BOK. BIBSYS had problems with network connections and MIKROPOLYDOC in Borüs did not have its own database from which records could be sent. Thus, this facility was not tested in the project.

All messages in all sessions were logged both by the originating system and by the target system. This made it possible to analyse errors in the communication link, errors in the BIBNETT-modules and why the sessions broke down when they did.

Statistical analysis of the logs shows the following:

Total number of searches carried out:		831
-searches in BIBSYS	171	
-searches in UBO:BOK	660	
Total number of positive answers:		460
-from BIBSYS	70	
-from UBO:BOK	390	
Total number of answers with no hits:		292
-from BIBSYS	40	
-from UBO:BOK	252	
Total number of full records transferred:		275
-from BIBSYS	53	
-from UBO:BOK	222	
Total number of short records transferred:		231
-from BIBSYS	17	
-from UBO:BOK	214	
Total number of transfers of full records that failed		28
-from BIBSYS	2	
-from UBO:BOK	26	

4. CONCLUSIONS DRAWN FROM THE PROJECT

In the beginning of the project it turned out that:

- BIBNETT-modules had both syntactical and logical errors
- application protocol was interpreted differently by different programmers
- application protocol was not exhaustive enough concerning some messages and functions

These disavantages were partly corrected by expanding and correcting the protocol.

During the project one experienced that error-handling procedures were not good enough in some of the modules. This lead to breakdown of many searching sessions. Thus, a need for better error-handling routines has been established. However, it was hardly possible to correct this during the project.

As for the use of public data networks, one can conclude that they are stable enough to support basic communication links between the systems, but there is a need for an "overhead", i.e. implementation of higher OSI-layers to make the communication safe and not vulnerable to breakdowns somewhere in the network.

The local area networks used at the sites where BIBSYS and UBO:BOK were placed did not have sufficient software for handling program-to-program communication. Such a service would be a desirable feature of LANs, which have been spreading rapidly, also in library environments.

The searching- and record transfer sessions carried out during the project showed that library systems communicating according to the BIBNETT-model can carry out sophisticated dialogues, with positive results. However, it is of great importance that the protocols defining the dialogues are unambiguous and that the implementation of the protocols is done with great care. It is also important that the protocols include extensive error-handling procedures.

In general, the Test Run project has shown that system-to-system communication is a feasible and reasonable method of accessing several different bibliographic databases by a user connected to a local library system.
This way of doing it eliminates the need for "intelligent interfaces", several different terminals, connect- and searching procedures etc.
However, it is important for such communication to be possible that the communication links are stable, i.e. supported by reliable networks. Furthermore, the computers on which the systems are run must be reliable.
By now, it seems that establishing a network connection from a library system to a library system is easier when done from a micro computer to a mainframe and not the other way.
This will however change, when first OSI-supporting, stable computer networks are available.

The Test Run project involved only library- and information retrieval systems, but there is no indication that e.g. publishers' systems could not be included in such a network of communicating systems.

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Interactive Display of Text and Graphics on an IBM PC

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Interactive Display of Text and Graphics on an IBM PC

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The paper discusses the problems and advantage of displaying documents stored on CD-ROM on current personal computer displays. The system developed can handle complex documents containing many fonts, equations and scanned graphics. Features include zooming, jumping and searching, presented to the user in a simple and natural interface.The documents displayed have been reformatted to take advantage of the flexibility of screen displays and to minimize its current size and resolution limitations.

Interactive Display of Text and Graphics on an IBM PC

by
Thomas B. Hickey
John C. Handley

Introduction

This paper describes an experimental document display system developed by OCLC's Office of Research as part of ongoing research into electronic document delivery. The material we have been working with is a database supplied by the American Chemical Society (ACS) consisting of their primary journals in machine readable form. The journals have a very complex and dense layout including a large number of different fonts, line drawings, photographs, mathematical equations, chemical equations and tables (Figure 1).

Our technique in working with these documents has been to translate the ACS typesetting tapes (including tables and equations) into the TeX typesetting system and store them for display in TeX's device independent output format (DVI). The graphics are scanned and stored as large images in a special font associated with each document.

The target hardware for our prototype electronic document delivery system consists of an IBM-PC with 640K bytes of memory and a Hercules graphics display board, an Hitachi CD-ROM reader and either an impact or laser printer. The expected users of the system included both librarians and end-users (e.g. chemists) who may be fairly naive computer users and can not be expected to go through a lengthy training session or to use the system on a regular basis.

All of these factors had effects on the user interface and program design. We wanted a display system which could be quickly called from an interactive retrieval system that would at least give users a chance to preview material before printing it and preferably enable them to actually read the document on the screen.

Goals

Our goal was to design and build a system with the speed needed for interaction within the document and between the retrieval system and display system; to give adequate functionality for use (zooming, scrolling, browsing) in a simple to use interface. As much as possible we wanted to build on our experience with typesetting, printing and previewing systems.

Starting point

At the start of this effort we had graphics scanned and stored at 16 dots/mm (although we are printing them at 12 dots/mm), TeX DVI files with notations for graphics and notes. Most document parts within the $\TeX$ file were clearly identifiable (e.g. title, abstract, authors and section headings). Through OCLC's Metafoundry, a division that creates digital fonts with Donald Knuth's METAFONT program, we had the ability to generate digital fonts at any resolution needed, but we had no high quality, hand-tuned low resolution fonts for screen displays. A large and complex set of $\TeX$ macros had been developed to automatically do page layout with graphics. Though we had lots of storage space on the CD-ROM (540M bytes), access times were long ($\approx$ 1/2 second). The IBM PC limited us to 640K of memory and a 720 × 348 display with a resolution of 3.15 dots/mm by 2.35 dots/mm.

The low screen resolution offered much of the challenge to presenting a readable display. The screen has 250,000 dots on it compared with a laser printer's 9,000,000 dots on an ISO A4 (210 mm × 297mm) page. The original typeset journal has even a higher resolution than this allowing even greater detail. Also, a paper journal enables a view of two consecutive pages and the pages can be turned quickly. Thus there is a large difference between the amount of information that can be presented to a user at any one time on the typical monochrome PC screen versus a paper copy. The greater interaction possibilities of the screen can be exploited to minimize the differences. The user can scroll the screen so that tables that go off the screen can be moved onto it as needed, graphics can be presented in a compressed representation and then zoomed for more detail, and the system can understand notes and figure references providing easy jumping to them. Much of the challenge was to use these techniques to offset inadequate resolution and slow access speeds for data stored on the CD-ROM.

Initial Design Decisions

Although the printed versions of the document in our system mimic the format of the published journal, it was decided that the screen display need not duplicate this original format. The two column format was simplified to one column, the Times Roman and Century Schoolbook fonts were replaced by sans serif fonts, and 9 point type was displayed in 14 point. We retained many of the typographical clues that clarify the layout and structure of a document in the printed version such as larger fonts for titles, italics in references, notes in smaller fonts and section headings in bold. Initially a simple table of contents was displayed on the first screen. This gave way to a more complex page with authors, title, and abstract in addition to the table of contents showing sections to which the user can jump. We had the tools and techniques to make these changes.

Since our target machines typically do not have a mouse for pointing we restricted ourselves to cursor movement for pointing. All of the user commands during the display are single keystrokes; there are no pop-up menus or other multi-step interactions.

How the System Looks to the User

The screen in Figure 2 shows the retrieval interface with the user ready to select a document. Each of the retrieved documents is represented by a single line reference. By moving the cursor to the reference line of a document and typing F1 the document will be displayed on the screen.

The first screen of a document is a title page with a complete reference, a table of contents of sections that the user can jump to and the complete abstract as shown in Figure 3. The abstract may hang off the bottom of the screen. This has proven to work very well, since it is very easy to scroll down the screen. Scrolling is controlled by holding a Shift key down while typing one of the cursor control keys.

The cursor changes shape depending on whether or not the system can be made to 'jump' to the page containing an object referred to on that page. The cursor points to the reference on the screen and the keystroke J will cause the jump. For instance, a reference to a table may occur within the text. The cursor will adopt the shape of an arrow pointing to the reference. Thus the user knows that a 'jump' can be made as well to what. Typing J displays the page containing the table. Hitting B displays the original page. A user can jump to sections referred to in the table of contents as well as jump to screens containing footnotes, tables, figures, etc. The cursor has a fine movement mode enabled by the Scroll Lock key to better control its position.

Scanned graphics are integrated with the text, as are tables and equations. The F1 command causes the view of the document to zoom. There are two zoom levels available (i.e. three possible magnifications). After the first zoom, all of the characters and symbols and most of the graphics are legible. After the next zoom to the highest magnification, the finest details of all the graphics are visible. The F4 command changes the cursor to a window whose height and width are half the size of the PC screen to indicate the area which would be expanded and displayed if the F1 command were given. Cursor movement, scrolling and jumping all work the same in these expanded modes.

The retrieval system retrieves a document based on the occurrence of strings typed in by the user. A feature of the display system allows the user to find those strings in the document. The N command will move the cursor to the next occurrence of one of the retrieval strings, and the P command finds the previous occurrence.

Speed

The speed of a display system is critical to its effectiveness. A great deal of effort has gone into making the system run as fast as possible given the inherent limitations of current CD-ROM readers. Displaying the first screen of a document is slow because many files need to be opened and accessed. Typical initial display times are 10 to 20 seconds. Displaying a new screen without graphics takes about 5 seconds, while scrolling a screen or zooming in on a section takes only about 1 second.

All of these times can lengthen if more access to the CD-ROM is needed. This happens with scanned graphics and unusual characters that have not been previously displayed and stored in memory. A typical page with a graphic will be displayed in under 15 seconds, while a full screen of dense graphics will take 30 to 90 seconds to display. During such long processing the program continues to check the keyboard for input so that the user can issue further commands (such as *Page Down* or *Home*) which will interrupt the current activity and allow the user to continue.

Implementation

Screen displays are generated by interpreting TeX's device independent (DVI) output file as video graphic operations. A DVI file is a complex sequence of page description commands. The commands describe the page by showing in a resolution independent way where to position characters on a page and where to draw rules (lines). Given the horizontal and vertical resolution of an output or display device the correct character positions on the screen for that device can be calculated. Since each page is described independently of the others, each page may be used to generate a screen display.

As a DVI page is processed, a list of characters to be set, the fonts in which they occur, and their calculated positions on the screen are kept in a list. Thus a page is stored temporarily in memory as a list of character codes, a number corresponding to a font, and an x-y position on the screen. The page display can then be zoomed and scrolled by performing scaling and translation operations on the character positions before displaying. This list is also used to search for strings on a page. The temporary storage of a page as such a list contributes to the flexibility and extensibility of the display interface.

It is sometimes useful to interpret a DVI page without putting anything on the screen. Thus a DVI page is interpreted either *invisibly* or *visibly*. For example, invisible interpretation is used when we simply want to look for a string on a page that is yet to be displayed in accordance with an *N* or *P* keystroke. Of course, visible interpretation is used mostly when we first see a page by paging down or jumping.

Two types of fonts are used, those composed of scanned graphics and those consisting of text characters and symbols. The scanned graphics (typically chemical structures or graphs) are treated as characters and are grouped into a font associated with each document. These so-called graphic fonts have large 'characters' that are used infrequently within a document, often only once, and are stored on the CD-ROM at a resolution higher than that used for the highest level of zoom. They are contrived and must be treated differently than the text character fonts.

When a non-graphic character is required for the display of a page, the character's description is read from its font file on the CD-ROM. For a character to be set and stored we need its width, height and reference point in pixels. We also need a digital representation of the character form such as a raster (array of pixels) or some type of encoded form. (For efficient storage, we use a type of run length encoding to store our characters on the CD-ROM). To set the character, the character representation is converted to a raster and copied into the right spot in the display memory causing it to appear on the screen. The character is stored in this raster form to be used again if needed. We allow for 32K bytes to store rasterized characters and their dimensions. For easy subsequent access, a list of pointers to the beginning of each stored character description is maintained. Characters that cannot be stored because these 32K bytes have been used up are interpreted directly from the font file on the CD-ROM. This means that font files for new characters must be opened if they are not already, degrading the display speed.

Prudent use of memory requires that no image representation be retained for graphic 'characters'. Every time in the course of a page display that a graphic is encountered, the image is read directly from the CD-ROM, scaled and displayed. This access slows the display of pages with graphics.

Since the access speed of current CD-ROM readers is slow relative to the access speed of a magnetic hard disk, we tried to minimize the number of file openings. The information accumulated about the characters is stored in main memory. Between retrieval sessions the arrays can be written to a disk. When a new retrieval session is started this information is read in if it is available. This is not strictly necessary but makes subsequent page display faster.

In the course of creating a TeX file from an ACS typesetting tape, references to such objects as sections, footnotes, tables and equations are denoted in the TeX file. When a DVI file is produced, invisible tags describing the type of referred object are inserted in the DVI file near these references. Also, a list of these objects and the pages where they occur is tabulated and output as a special invisible cross reference page. When a document is displayed, this cross reference page is invisibly interpreted first to build a table of objects and the pages where they occur. When a particular page is interpreted for display, the display system looks for the inserted reference tags and builds a list containing the object refered to and the position on the page where the tag was found. As the cursor is moved, its position is compared to the list of tags and positions. If a tag is close, the cursor shape is changed to to a left or right arrow to point to the position of the tag on the displayed page (Figure 4). When the cursor adopts one of the two arrow shapes the user knows that it is possible to jump to the page containing the refered object. When the $\boxed{J}$ key is hit, the closest tag is checked against the cross reference list to find the page containing the reference. Once found, the page is displayed (Figure 5).

For debugging purposes, transaction analysis and performance evaluation, a log file is maintained that any function in the program may write to. In particular, keyboard input is logged as well as retrieval results. The log file is cumulative so that usage and performance over a number of sessions and users may be tracked.

Experience

We have just begun putting this system in some libraries and research centers for evaluation, but the reactions so far have been very good. The chemists enjoy viewing the graphics displayed on the screen, and everyone agrees that they are critical for much use of the system.

The speed of display is actually faster than we expected to achieve when we first started. The 15 second delay in transferring from the retrieval to display limits the amount of quick interaction between the two systems, but is certainly tolerable for many uses, being much faster than finding the article itself, even if on a nearby shelf. The single character commands seem quite easy for users to master, especially since the labeled keys on the keyboard allow a fair amount of functionality by themselves.

We plan to continue development of systems for document display. An immediate project will be to port the system to the Apple Macintosh. Beyond this we will be experimenting with larger screens on the PC and the use of gray scale for fonts and graphics and the possibility of dynamically reformatting the document to accommodate differently shaped windows and displays.

Organometallics 1986, 5, 209-215

Kinetic Investigation of the Cleavage of *n*-Butyryl- or Isobutyrylcobalt Tetracarbonyl with Hydridocobalt Tetracarbonyl or Dihydrogen

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The acylcobalt tetracarbonyls $n\text{-}C_3H_7C(O)Co(CO)_4$ (1) and $i\text{-}C_3H_7C(O)Co(CO)_4$ (2) react with H_2 or $HCo(CO)_4$ to yield *n*-butyraldehyde and isobutyraldehyde, respectively. The reactions, which are part of the catalytic cycle in the industrially important hydroformylation of propene, go over the corresponding acylcobalt tricarbonyls as intermediates formed by CO loss. Radical pathways of aldehyde formation may be excluded. Although the rate constants of the reactions with $HCo(CO)_4$ are at 25 °C 24–34 times larger than those with H_2, under the conditions of catalytic hydroformylation (>100 °C and >100 bar H_2 + CO) the reaction with H_2 is mainly responsible for aldehyde formation because of its stronger temperature dependence and the large concentration of H_2.

Introduction

The cleavage of acylcobalt carbonyls by $HCo(CO)_4$ or by H_2 is regarded as the ultimate step of aldehyde formation in hydroformylation:[1]

$$RC(O)Co(CO)_4 + HCo(CO)_4 \rightarrow RCHO + Co_2(CO)_8 \quad (1)$$

$$RC(O)Co(CO)_4 + H_2 \rightarrow RCHO + HCo(CO)_4 \quad (2)$$

Conflicting reports have appeared in recent years regarding the relative importance of reactions 1 and 2 under catalytic conditions (>100 °C, >100 bar H_2 + CO). On the basis of high-pressure IR studies Alemdaroglu et al. claimed reaction 1 to be the principal route of aldehyde formation,[2] whereas Mirbach provided evidence for the predominant role of reaction 2.[3]

There is also some dispute over the mechanism of these reactions. In the case of R = EtO we have shown that the rate of ethyl formate formation is first order in $EtOC(O)Co(CO)_4$, first order in H_2 or $HCo(CO)_4$, and negative first order in CO. Most probably the bimolecular reaction between coordinatively unsaturated $EtOC(O)Co(CO)_3$ and the reducing agent is involved in the rate-determining step.[4] Similar kinetics were found for the cleavage of $EtOC(O)CH_2Co(CO)_4$ with H_2 or with $HCo(CO)_4$.[5] For R = $n\text{-}C_5H_{11}$ in reaction 1, however, it has been reported that contrary to earlier findings[6] the rate of aldehyde formation was not affected by CO and the reaction may be radical in character.[7]

Recently one of use developed a new way for the preparation of pure *n*-butyrylcobalt tetracarbonyl (1) and isobutyrylcobalt tetracarbonyl (2) by the fast and quantitative reaction of $HCo(CO)_4$ at −79 °C with ethylketene and dimethylketene, respectively.[8] Both complexes are believed to be intermediates in the commercially important propene hydroformylation. Using these model substances, we now studied the kinetics of their reductive cleavage by H_2 and $HCo(CO)_4$ in order to obtain information about the relative importance of reactions 1 and 2 and about their mechanism.

Results

n-Butyraldehyde and isobutyraldehyde were formed in quantitative reactions from *n*-butyrylcobalt tetracarbonyl (1) and isobutyrylcobalt tetracarbonyl (2), respectively, using either $HCo(CO)_4$ or H_2 under 0.5–3 bar total pressure of CO or CO + H_2 mixtures at 20–45 °C in *n*-heptane solution according to the stoichiometries of eq 3–6.

$$\underset{\mathbf{1}}{n\text{-}PrC(O)Co(CO)_4} + HCo(CO)_4 \xrightarrow{r_3} n\text{-}PrCHO + Co_2(CO)_8 \quad (3)$$

$$\underset{\mathbf{2}}{i\text{-}PrC(O)Co(CO)_4} + HCo(CO)_4 \xrightarrow{r_4} i\text{-}PrCHO + Co_2(CO)_8 \quad (4)$$

$$2\,n\text{-}PrC(O)Co(CO)_4 + H_2 \xrightarrow{r_5} 2\,n\text{-}PrCHO + Co_2(CO)_8 \quad (5)$$

$$2\,i\text{-}PrC(O)Co(CO)_4 + H_2 \xrightarrow{r_6} 2\,i\text{-}PrCHO + Co_2(CO)_8 \quad (6)$$

The initial rates of these reactions could be measured by infrared spectroscopy following the decrease of acyl complex concentration and by the increase of product concentration. From the results of the kinetic measurements at 25 °C (Figure 1 and Table I), reaction rates first order in 1 or 2, approximately first order in $HCo(CO)_4$ or H_2, and approximately negative first order in CO were calculated. Both reductions showed a strong temperature dependence (Figure 2) and became faster by using $DCo(CO)_4$ and D_2 instead of $HCo(CO)_4$ and H_2, respectively (Table II).

At low concentrations of H_2 (p_{H_2} ~ 1 bar) no $HCo(CO)_4$ could be detected as an intermediate in reactions 5 and 6 by IR. At higher concentrations of H_2 (p_{H_2} = 50–80 bar), however, considerable amounts of $HCo(CO)_4$ accompanied the aldehyde product. Under the same conditions no $HCo(CO)_4$ could be detected in a blank experiment starting from $Co_2(CO)_8$ alone (Table III). These experiments show that aldehyde formation with H_2 occurs in two steps over

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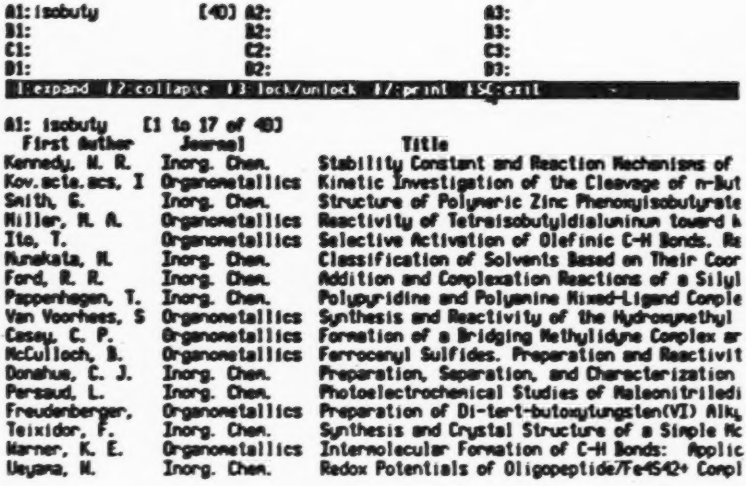

```
A1: isobuty              [40] A2:                         A3:
B1:                           B2:                         B3:
C1:                           C2:                         C3:
D1:                           D2:                         D3:
 1:expand  F2:collapse  F3 lock/unlock  F7:print  ESC:exit

A1: isobuty    [1 to 17 of 40]
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Warner, K. E.    Organometallics  Intermolecular Formation of C-H Bonds:  Applic
Ueyama, N.       Inorg. Chem.     Redox Potentials of Oligopeptide/Fe4S42+ Compl
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Organometallics, Vol 5, No. 2, 1986, pp 209-215

Kinetic Investigation of the Cleavage of *n*-Butyryl- or Isobutyrylcobalt Tetracarbonyl with Hydridocobalt Tetracarbonyl or Dihydrogen

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Abstract

The acylcobalt tetracarbonyls *n*-$C_3H_7C(O)Co(CO)_4$ (1) and *i*-$C_3H_7C(O)Co(CO)_4$ (2) react with H_2 or $HCo(CO)_4$ to yield *n*-butyraldehyde and isobutyraldehyde, respectively. The reactions, which are part of the catalytic cycle in the industrially important hydroformylation of propene, go over the corresponding acylcobalt tricarbonyls as intermediates formed by CO loss. Radical pathways of aldehyde formation may be excluded. Although the rate constants of the reactions with $HCo(CO)_4$ are at 25 °C 24-34 times larger than those with H_2, under the conditions of catalytic hydroformylation (>100 °C and >100 bar H_2 + CO) the reaction with H_2 is mainly responsible for aldehyde formation because of its stronger temperature dependence and the large concentration of H_2

Figure 3

Organometallics, Vol 5, No. 2, 1986, pp 209-215 ¶¶ 5-6

Results

n-Butyraldehyde and isobutyraldehyde were formed in quantitative reactions from *n*-butyrylcobalt tetracarbonyl (**1**) and isobutyrylcobalt tetracarbonyl (**2**), respectively, using either $HCo(CO)_4$ or H_2 under 0.5-3-bar total pressure of CO or CO + H_2 mixtures at 20-45 °C in *n*-heptane solution according to the stoichiometries of eq 3-6.

$$\underset{\mathbf{1}}{n\text{-PrC(O)Co(CO)}_4} + HCo(CO)_4 \xrightarrow{r_3} n\text{-PrCHO} + Co_2(CO)_8 \quad (3)$$

$$\underset{\mathbf{2}}{i\text{-PrC(O)Co(CO)}_4} + HCo(CO)_4 \xrightarrow{r_4} i\text{-PrCHO} + Co_2(CO)_8 \quad (4)$$

$$2\,n\text{-PrC(O)Co(CO)}_4 + H_2 \xrightarrow{r_5} 2\,n\text{-PrCHO} + Co_2(CO)_8 \quad (5)$$

$$2\,i\text{-PrC(O)Co(CO)}_4 + H_2 \xrightarrow{r_6} 2\,i\text{-PrCHO} + Co_2(CO)_8 \quad (6)$$

The initial rates of these reactions could be measured by infrared spectroscopy following the decrease of acyl complex concentration and by the increase of product concentration. From the results of the kinetic measurements at 25 °C (Figure 1 [illegible] Table I), reaction rates first order in **1** or **2**, approximately first order in $HCo(CO)_4$ or H_2, and approximately negative first order in CO were calculated. Both reductions showed a strong temperature dependence (Figure 2) and became faster by using $DCo(CO)_4$ and D_2 instead of $HCo(CO)_4$ and H_2, respectively (Table II).

Figure 4

Organometallics, Vol 5, No. 2, 1986, pp 209-215 ¶ 7

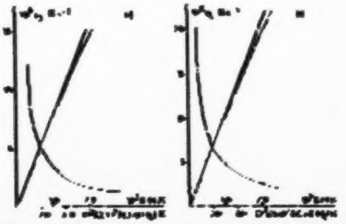

Figure 1. Influence of concentrations of initial rates of *n*-butyrylcobalt tetracarbonyl (1; r_3) and isobutyrylcobalt tetracarbonyl (2; r_4) consumption (eq 3 and 4) at 25 °C in *n*-heptane solution. a: o, experiments at constant [1] = 0.0122 M and [CO] = 0.0108 M; x, experiments at constant [$HCo(CO)_4$] = 0.0122 M and [CO] = 0.0108 M; +, experiments at constant [1] = [$HCo(CO)_4$] = 0.0122 M. b: o, experiments at constant [2] = 0.0122 M and [CO] = 0.0108 M; x, experiments at constant [$HCo(CO)_4$] = 0.0122 M and [CO] = 0.0108 M; +, experiments at constant [2] = [$HCo(CO)_4$] = 0.0122 M.

At low concentrations of H_2 (p_{H_2} ~ 1 bar), no $HCo(CO)_4$ could be detected as an intermediate in reactions 5 and 6 by IR. At higher concentrations of H_2 (p_{H_2} = 50-80 bar), however, considerable amounts of $HCo(CO)_4$ accompanied the aldehyde product. Under the same conditions no $HCo(CO)_4$ could be detected in a blank experiment starting from $Co_2(CO)_8$ alone (Table III). These experiments show that aldehyde formation with H_2 occurs in two steps over reaction 2 followed by reaction 1, and at sufficiently high H_2 concentrations reaction 2 may become faster than reaction 1. The observed

Figure 5

CD-ROM Public Access Library Catalogues: Uses, Advantages, Problems

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CD-ROM Public Access Library Catalogues: Uses, Advantages, Problems

Charles R. Hildreth

This presentation will provide an overview of currently available optical (laser) data storage technologies and their use in OPACs and information retrieval systems. The technical features of the various optical media will be discussed, and the process of producing ("mastering") optical disks will be outlined in some detail. One or more operational CD-ROM OPACs will be introduced.

Optical PACs ("LASER-PACs"?) hold the promise of bringing enhanced interactive library catalogs and information retrieval systems to more users at reduced costs, and provide library managers with more flexible installation and placement options. However, several issues and problems remain to be resolved before there will be widespread adoption and integration of optical media in OPACs and conventional automated library systems. Issues to be addressed include: the need for standards for file structure and indexing, search software, and user interfaces; problems involved in the transfer of current databases to the new medium (costs, time, accuracy, etc.); the availability of disk mastering and replication services for bibliographic and textual data; and the problems of integrating the new optical systems with existing automated library systems.

Slide One

OUTLINE

I. CD-ROM (compact disc - read-only memory) PACs (public access catalogs): Uses

II. CD-ROM PACs: Advantages of the New Medium

III. A Closer Look at the Technology of Optical Storage

IV. CD-ROM PACs Compared With Other Forms of the Catalog

V. Some Limitations and Problems to be Overcome

VI. Two Recent CD-ROM Library Catalog Products

Slide Two

USES OF CD-ROM PACs

- New Products Introduced in 1985-1986 (e.g., Brodart's *Le Pac*)

- CD-ROM + Personal Computer =

"Interactive COM Catalog"

- Advantages of COM, plus -

1) online retrieval capabilities

2) improved readability

3) stand-alone, single-station completeness

or

"Unconventional, extended OPAC"

1) enriched indexing

2) associated, integrated reference files

3) a personal, portable workstation

- To Replace COM Catalogs

- To Backup Conventional OPACs

- For Union Lists or Catalogs

- For Single or Multiple Databases

- For Reference Extensions to OPACs

- Easy Distribution to Multiple Locations (minus telecom.)

Slide Three

ADVANTAGES OF CD-ROM PACs

- A New Approach to Information Storage, Distribution, and Retrieval

- CD-ROM Provides:

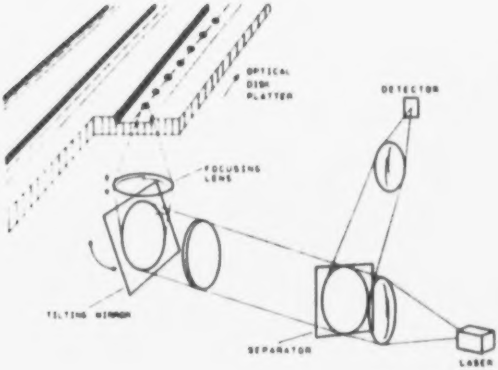
    - Large storage capacity (up to 1,000,000 titles)
    - Compact size (4.72", 12cm)
    - Accessible by personal computer (a local, personal system)
    - Low equipment costs ($500-$1500)
    - Low per/copy disc costs (under $50)
    - Low transmission costs
    - Reliable and accurate
    - Durable, removable, and easily distributable
    - Non-alterable, long data life
    - Cost-effective as COM
    - Flexible installation/placement options

Slide Four

WRITING TO AND READING OPTICAL MEDIA

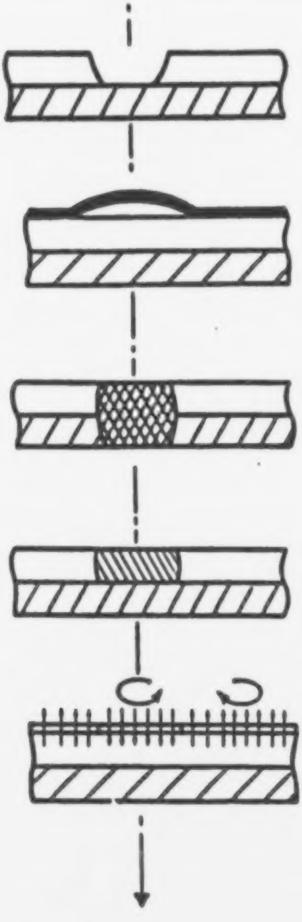
- Optical = Laser; Laser = Optical
- Media surface marks + reflected light = digital data

Writing and reading optical disc data diagram


OPTICAL DISK PLATTER
DETECTOR
FOCUSING LENS
TILTING MIRROR
SEPARATOR
LASER

Slide Five

PRINCIPAL OPTICAL RECORDING METHODS



Pit Forming

Bubble Forming

Alloying

Phase-Change*

Magneto-Optic*

Centerline of Bit Cell

*Reversible process

Slide Six

THREE TYPES OF OPTICAL STORAGE TECHNOLOGIES

Functionality	Medium	Analog/Digital Encoding	
READ-ONLY	Videodisc (8" or 12")	x	x
	CD-ROM (4.72")		x
	OROM (5.25")		x
WRITE-ONCE	Videodisc (8" or 12")	x	
	DRAW/WORM (many sizes)		x
ERASABLE	Under development Variable sizes		x (impermanent, reversable signals)

Slide Seven

CD-ROM DISC STORAGE CAPACITY

(Diameter: 12cm; 4.72 inches)
Three mile long spiral track
Eight billion pits

75 MINUTES OF MUSIC

275,000 PAGES OF TEXT

1400 5.25 INCH FLOPPY DISCS

550,000 MILLION BYTES OF DATA

18,000 PAGES OF COMPUTER GRAPHICS

25 X MORE DATA THAN 20MB HARD DISK

4,500 HRS. OF DIGITIZED VOICE (16kbs)

46 DAYS DATA TRANSMISSION AT 1200 BAUD

AN ENTIRE ENCYCLOPEDIA WITH INDEX TO EVERY WORD

Slide Eight

OPTICAL INFORMATION SYSTEMS
MAJOR COMPONENTS

DATA/GRAPHIC/IMAGE FILES

OPTICAL DISCS

DISC PLAYER/DRIVE

INTERFACE CONTROLLER CARD & SW

APPLICATIONS SOFTWARE
(e.g., search and retrieval)

MICROCOMPUTER/PRINTER

USERS
(Intermediate and "end")

Slide Nine

OPTICAL INFORMATION SYSTEMS
"PLAYERS IN THE GAME"

* EQUIPMENT MANUFACTURERS

* PUBLISHERS

* SW APPLICATIONS DESIGNERS

* DATA FILE PREPARATION SPECIALISTS
"Systems Integrators"

* DISC PRODUCTION PERSONNEL
(Pre-mastering, Mastering, & Replication)

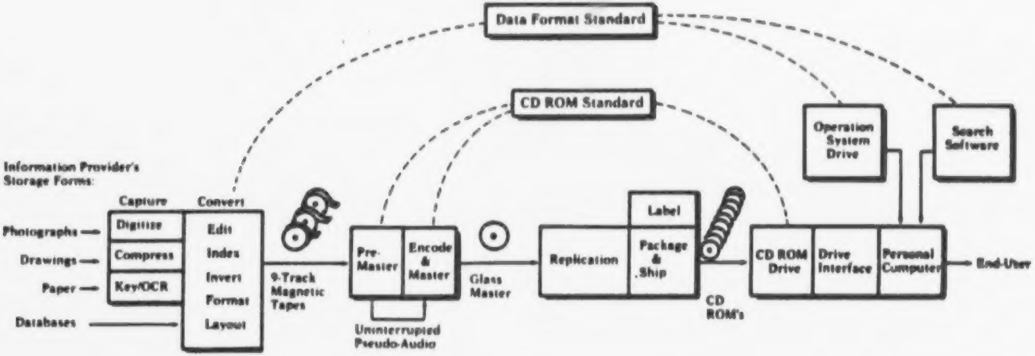
* DISC DISTRIBUTORS

* USERS

* STANDARDS BODIES

Slide Ten

This diagram presents the steps involved in the production of CD ROM by 3M. The current NV Philips/Sony standard covers only the production and placement of data on the CD ROM disk. Industry leaders and NISO are currently working to create a data format standard to insure compatibility between CD ROM disks, drives and microcomputer hosts. [Courtesy of 3M Corp.]



Data Format Standard
CD ROM Standard
Information Provider's Storage Forms:
Photographs
Drawings
Paper
Databases
Capture
Digitize
Compress
Key/OCR
Convert
Edit
Index
Invert
Format
Layout
9-Track Magnetic Tapes
Pre-Master
Encode & Master
Uninterrupted Pseudo-Audio
Glass Master
Replication
Label
Package & Ship
CD ROM's
Operation System Drive
Search Software
CD ROM Drive
Drive Interface
Personal Computer
End-User

Slide Eleven

THE CD-ROM PRODUCTION PROCESS

DATABASE MANAGER

- Convert/Create Database
- Maintain Database
- Prepare Data for CD-ROM Use

DISC PRODUCER

- Pre-Mastering
- Mastering
- Replication
- Quality Control - Physical
- Label, Pack, and Ship

SYSTEM INTEGRATOR

- Integration With System
- Quality Control - Logical
- Label, Pack, and Ship

Slide Twelve

DATABASE MANAGER'S RESPONSIBILITIES

CONVERT/CREATE DATABASE

- Done Once
- Requires Careful Planning
- Expensive

MAINTAIN DATABASE

- Ongoing Activity
- Requires High Degree of Control
- Can Be Costly: Varies With Method, Volume, Frequency

PREPARE DATA FOR CD-ROM USE

- Periodic Activity
- End Use Orientation
- Technically Complex
- Costs Vary With Complexity and Volume

Slide Thirteen

PREPARING DATA FOR CD-ROM USE

BATCH PROCESSING

- Authority Control
- Data Integration
- Data Selection
- Sorting/Filing

CONTENT SELECTION

CONTENT FORMATTING

INDEXING

DISC LOCATION ASSIGNMENT

- Sequencing
- Performance

INTEGRATION OF DATA AND INDEX

PHYSICAL FORMATTING

- Blocking
- Conversion to Magnetic Tape

SHIP DATABASE TO DISC PRODUCER

Slide Fourteen

DISC PRODUCER'S RESPONSIBILITIES

PRE-MASTERING

- Expand Data Records
- Assign ECC Codes
- Encode Data
- Convert to Digital Audio Format

MASTERING

- Direct Interface
- 3/4 Inch Tape

REPLICATION

QUALITY CONTROL - PHYSICAL

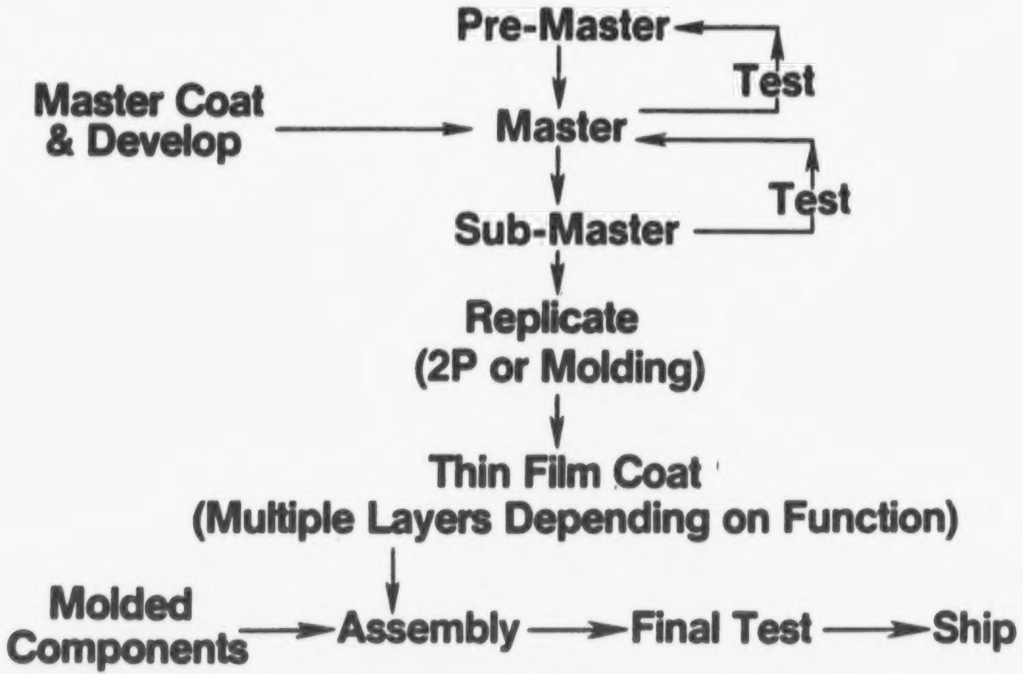
LABEL, PACK, AND SHIP

COSTS

- Master = $3,000 - $6,000
- Copies = $10 - $50 each

Slide Fifteen

Generic Process Sequence



Pre-Master

Test

Master Coat
& Develop

Master

Test

Sub-Master

Replicate
(2P or Molding)

Thin Film Coat
(Multiple Layers Depending on Function)

Molded
Components

Assembly

Final Test

Ship

Slide Sixteen

SYSTEM INTEGRATOR'S RESPONSIBILITIES

INTEGRATION WITH SYSTEM/SOFTWARE

- Testing
- Adjustments

QUALITY CONTROL - LOGICAL

- Performance
- Content

LABEL, PACK, AND SHIP

COSTS DEPEND UPON COMPLEXITY AND VOLUME

Slide Seventeen

CD-ROM COMPARED WITH OTHER FORMS OF THE CATALOG

CHARACTERISTIC	CARD	COM	ONLINE	CD-ROM
PURCHASE COSTS	LOW	MEDIUM	HIGH	MEDIUM
OPERATING COSTS	LOW	LOW	MEDIUM	LOW
EXPANSION COSTS	LOW	LOW	MEDIUM	LOW
STAFF REQUIREMENTS	HIGH	LOW	LOW	LOW
AVAILABILITY	1 COPY	MULTIPLE-COPIES	MULTIPLE-COPIES	MULTIPLE-COPIES
USER FILE ENTRY	DICTIONARY, PHRASE	DICTIONARY, PHRASE	KEYWORD, PHRASE	KEYWORD, PHRASE
ACCESS POINTS	FIRST WORD AU,TI,SU	FIRST WORD AU,TI,SU,	ANY FIELD & FULL TEXT	ANY FIELD & FULL TEXT
USER ASSISTANCE	NO	NO	UNLIMITED	UNLIMITED
CURRENCY	NEVER	1-3 MO.	1 DAY	1-3 MO.
FLEXIBILITY	NONE	SOME	MUCH	MUCH
RELIABILITY	HIGH	MEDIUM	? CENTRAL COMPUTER ?	MEDIUM-HIGH
HARD-COPY BACKUP	NO, COSTLY	YES	YES	YES
DATABASE SHARING	NO	YES	YES, WITH TELECOM	YES
INTERFACE TO CIRCULATION	NO	NO	YES	YES
USER ACCEPTABILITY	LOW	LOW	HIGH	HIGH

Slide Eighteen

CD-ROM PACs:

LIMITATIONS & PROBLEMS

- New Technology, New Industries: New Players and Dependencies
- High Production and Mastering Costs
- External, Complex, Timely Production Process
- Availability of Disc Production Facilities
- Disc Production Competition From Audio and Optical Publishers
- Delayed Updating = Lack of Currency
- Read-Only (cannot modify)
- Lack of Equipment/Software/Data Disc Compatibility
- Requires New Applications Software
- Lack of Standard, Common Search Software
- Difficult Integration With Other Local Automated Systems and Magnetic Media
- Life-Time of New Technology??

Slide Nineteen

TWO CD-ROM LIBRARY CATALOG SYSTEMS

- BRODART COMPANY'S "Le Pac"

- ONLINE COMPUTER SYSTEMS, INC.'s
Online CD-ROM Search System

Slide Twenty

Le Pac

LIBRARY AUTOMATION
by Brodart
Le Pac

Slide Twenty One

Le Pac is Remarkable.

The Le Pac system is capable of storing up to 1,000,000 MARC formatted bibliographic records with indexes for author, title and subject access. Available options increase its potential storage capacity to 4,000,000 MARC records.

Le Pac is Reliable.

It is not susceptible to damage or data loss that plague some magnetic recording media. Unlike on-line systems, there is no downtime. Le Pac is always ready to serve your patrons.

Le Pac is Economical.

Any library planning conversion to a COM catalog, should consider Le Pac. The production cost of the Le Pac disks is the same as the cost of COM film or fiche production.

Telecommunications costs and/or hardware costs, keep many libraries from going on-line. Le Pac has the benefits of an on-line public access catalog without the expense. There is no downtime with Le Pac, it is always ready to serve library patrons. Most users will probably assume that they are using a powerful on-line system.

Le Pac is Effective.

Resource sharing has become an important issue in these days of shrinking materials budgets. Le Pac provides an economical and easily accessible vehicle for the creation of large union databases. Le Pac's incredible storage capacity makes it possible to provide easy access to virtually any network or consortium's union catalog.

Le Pac is the Future.

Compact disk technology has provided the means of developing products that would have been unthinkable, or unaffordable just a short time ago. Le Pac is just the first step for Brodart. As the Le Pac customers base continues to grow, new features, and related products will undoubtedly be developed to meet customers future needs.

Slide Twenty Two

Access

Le Pac is the most user friendly public access catalog ever developed. Using the specially designed ten key pad, a patron may choose to access the catalog by title, author, or subject. The patron need not deal with unfamiliar commands or complicated keyboards. Simple step-by-step instructions appear on the screen throughout the entire process.

Le Pac's overwhelming advantage is the speed and ease with which searches are conducted. To further simplify the use of Le Pac, call number references have been included at several levels in the title, author, and subject indexes. Patrons will be able to obtain enough information to browse the stacks within seconds.

Le Pac users have a choice of access. Using the optional full keyboard, patrons may conduct "Expert" searches. Records may be accessed by author, title, subject, or "Anyword", using search logic similar to Brodart's on-line Interactive Access System.

Hardware

The Le Pac viewing station is a self-contained unit designed to be used directly by the public. Its major components consist of:

- A CD ROM internal drive with 550 million characters of storage.
- IBM compatible personal computer components including chassis, main board, power supply, 512 thousand characters of memory and a TTL video interface.
- A video monitor with swivel base and green or amber display.
- Le Pac read only memory (ROM) chips.
- Le Pac keyborad with ten specially engraved keys.
- Le Pac system cover with key lock and system security feature.

Optional features include:

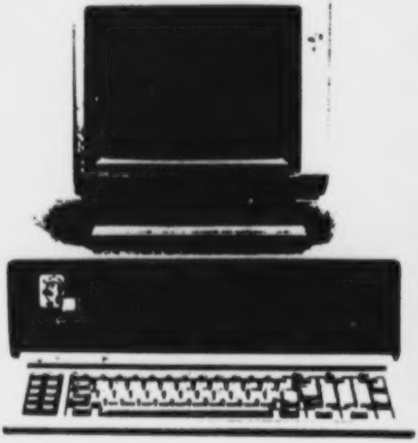
- Parallel or serial printer interface.
- Printer (ink jet, dot matrix or thermal).
- Serial communications interface.
- Interface or external modem.
- Floppy disk drives (up to 3).
- Additional CD ROM drives (up to 3).
- 5, 10 or 20 MEG hard disk drive.

Production

A library's database is processed on Brodart's central computer system. If Brodart is not currently managing a library's database, Le Pac can be created by using many other approved format files used by other bibliographic utilities.

Using specially designed programs, the entire database is transferred to a compact disk. This disk, along with the CD ROM reader and Brodart's software, combine to provide the most efficient mass storage system available.

As with all Brodart bibliographic systems, the database is formatted according to MARC standards and may contain Library of Congress and locally entered cross-references.



Software

The software which controls Le Pac consists of 43 program modules written in Microsoft Pascal and Microsoft 8086 Assembler for use on any IBM-compatible personal computer using either PC-DOS or MS-DOS level 2.0 or higher. These program modules are organized into functional groups that control CD ROM access, MARC data formatting, display screen formatting, index searching, communications and printing. Externally defined profiles are used to specify data, screen communication and print formats. This makes it possible to customize most aspects of Le Pac's operation without program modification.

All necessary software and one copy of BRO-DOS is supplied with each Le Pac viewing station.

Database Processing

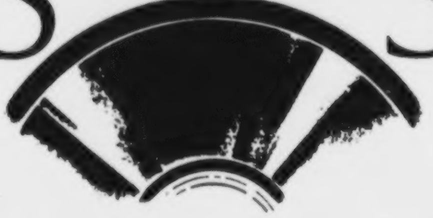
Bibliographic information is stored on Le Pac formatted CD ROM disks in a particular manner designed to minimize access time when Le Pac is used as a public access catalog. This requires extensive manipulation of the bibliographic database prior to the creation of the CD ROM disk. Brodart performs this database processing on its IBM 3083 mainframe computer as a part of the CD ROM premaster process.

Bibliographic Database

The Le Pac system is designed to work with any machine-readable bibliographic database formatted according to MARC II communications format specifications. Variations to that format, such as produced by other bibliographic utilities may also be acceptable.

Slide Twenty Three

SEARCHES



I A search is conducted in six steps, with detailed instructions presented with each step. A screen is displayed whenever the patron presses the RESET key. This screen asks the patron to choose the method of access to the catalog. The traditional Author, Title and Subject access points are provided. The patron indicates the desired method of access by pressing either the AUTHOR, TITLE or SUBJECT key on the Le Pac keyboard.

II Step II presents the patron with an alphabetical list of phrases from the catalog. The phrases are selected from the alphabetical lists of Authors, Titles and Subjects contained in the catalog. Each phrase represents a point in the alphabet. The total number of phrases is based upon the number of titles in the catalog and is selected so that the phrases are spaced evenly throughout the entire alphabet

Guide phrases are displayed on the right hand side of the screen. The catalog user may position any one of the phrases next to the select arrow using the UP and DOWN keys. Then, the SELECT key is used to continue the search with more detailed information.

Using the UP and DOWN keys located on the Le Pac keyboard, the patron is asked to locate the phrase closest to the desired subject. Pressing one of these keys causes the list of phrases to move up or down. The list of phrases is a continuous list that runs completely through the alphabet and can be moved in either direction. The entire list can be viewed in less than ten seconds. When the desired phrase is located on the highlighted SELECT line, the patron presses the SELECT key to continue the search.

III Selecting a phrase in Step II causes a second list of phrases to be displayed. This list is exactly like the first list, except that the phrases are spaced more closely together in the alphabet. This is also a continuous list evenly spaced throughout the alphabet. The patron uses the UP, DOWN and SELECT keys to narrow the search. The PREVIOUS key may be used to return to Step II if it becomes necessary to move more quickly to a different location in the alphabet.

IV The information displayed in this step is in alphabetical order according to ALA filing rules and runs continuously through the alphabet. For authors and subjects, the most commonly used call number is also shown to allow the patron to go directly to the stacks if a particular title is not required. For titles, the exact call number is shown.

With authors and subjects, see cross-references are provided. These cross-references may be supplied locally through a database maintenance or automatically from Library of Congress or they may be a combination of both.

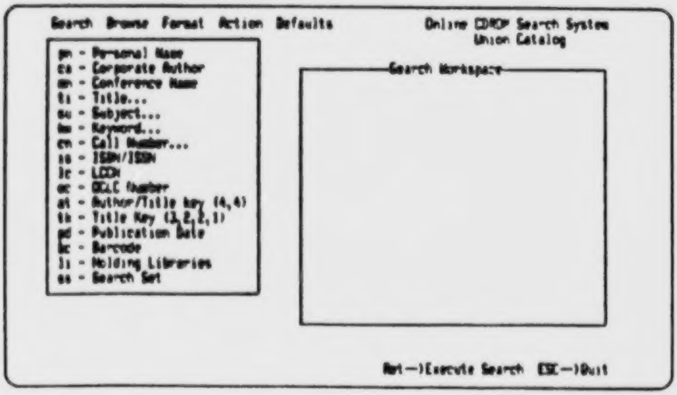
The patron may choose to continue the search to obtain more detailed information. The UP, DOWN, SELECT and PREVIOUS keys are used to select the desired author, title or subject. The information displayed on the screen may also be printed using the optional printer.

V Step V is only used with author and subject searches. When a specific author or subject term is selected, the titles of all of the works contained in the catalog that have a reference to the selected term are displayed. Again, the display is in alphabetical order and runs continuously through the alphabet. The call number for each title is shown.

As with other steps, the UP, DOWN, SELECT and PREVIOUS keys are used to select the desired title. Optionally, the entire list of titles may be printed.

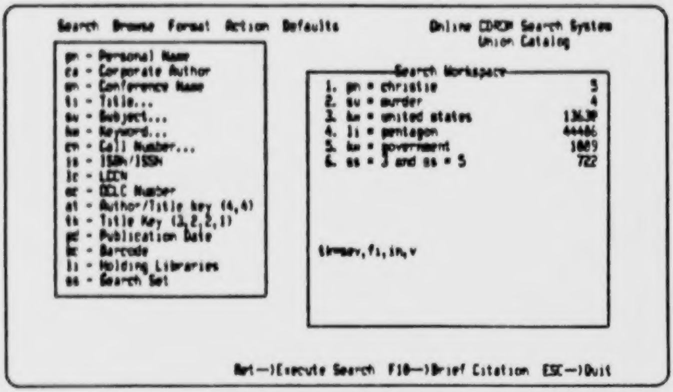
VI In this step, the entire bibliographic record is displayed. Each library may determine exactly which MARC fields are shown and how the display is formatted. The holdings information representing branch identification codes will be displayed on this screen. A library may elect to use mnemonics or actual branch names.

Slide Twenty Four



```
Search  Browse  Format  Action  Defaults          Online CDROM Search System
                                                          Union Catalog
 pn - Personal Name
 ca - Corporate Author
 mn - Conference Name
 ti - Title...
 su - Subject...
 kw - Keyword...
 cn - Call Number...
 is - ISBN/ISSN
 lc - LCCN
 oc - OCLC Number
 at - Author/Title key (4,4)
 tk - Title Key (3,2,2,1)
 pd - Publication Date
 bc - Barcode
 li - Holding Libraries
 ss - Search Set
                                   ----Search Workspace----

                                  Ret—>Execute Search  ESC—>Quit
```



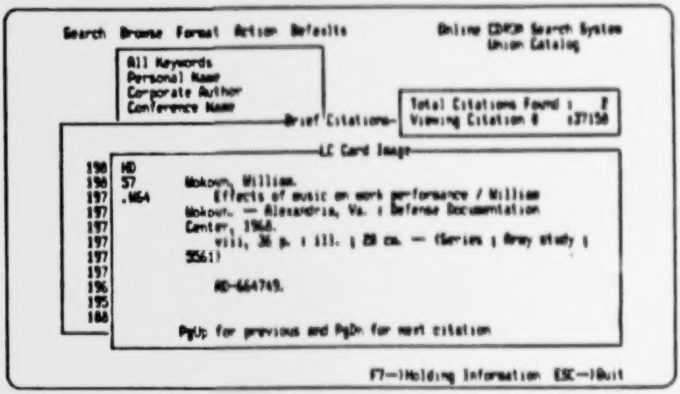
```
Search  Browse  Format  Action  Defaults          Online CDROM Search System
                                                          Union Catalog
 pn - Personal Name
 ca - Corporate Author
 mn - Conference Name
 ti - Title...
 su - Subject...
 kw - Keyword...
 cn - Call Number...
 is - ISBN/ISSN
 lc - LCCN
 oc - OCLC Number
 at - Author/Title key (4,4)
 tk - Title Key (3,2,2,1)
 pd - Publication Date
 bc - Barcode
 li - Holding Libraries
 ss - Search Set
                                   ----Search Workspace----
                                   1. pn = christie              5
                                   2. su = murder                4
                                   3. kw = united states     13630
                                   4. li = pentagon         44486
                                   5. kw = government        1089
                                   6. ss = 3 and ss = 5       722

                                   $k=gov,fi,in,v

              Ret—>Execute Search  F10—>Brief Citation  ESC—>Quit
```

Online Computer Systems, Inc.

Slide Twenty Five


Search Browse Format Action Defaults
Online CDROM Search System
Union Catalog
All Keywords
Personal Name
Corporate Author
Conference Name
Brief Citations
LC Card Image
F7—)Holding Information ESC—)Quit

```
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197            Wokoun. — Alexandria, Va. : Defense Documentation
197            Center, 1968.
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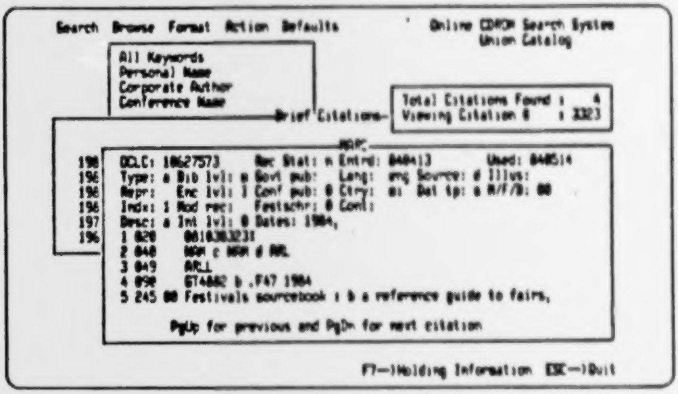
Search Browse Format Action Defaults
Online CDROM Search System
Union Catalog
All Keywords
Personal Name
Corporate Author
Conference Name
Brief Citations
MARC
F7—)Holding Information ESC—)Quit

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     2 040     NRM c NRM d ARL
     3 049     ARLL
     4 090     GT4802 b .F47 1984
     5 245 00 Festivals sourcebook : b a reference guide to fairs,

          PgUp for previous and PgDn for next citation
```

Online Computer Systems, Inc.

OPTICAL DISK PILOT PROGRAM
AT THE LIBRARY OF CONGRESS

Joseph W. Price
Chief, Science and Technology Division
The Library of Congress
U.S.A.

OPTICAL DISK PILOT PROGRAM AT THE LIBRARY OF CONGRESS

Joseph W. Price
The Library of Congress

The opportunities offered by optical disk technology are being studied for their potential application to information preservation and information access and management. Goals are to find a stable storage medium; to monitor recording quality electronically; to transfer information from disks without generational loss; and to provide rapid user access to large quantities of information made possible by increased recording density. Techniques are being explored for both print and non-print (visual and sound) materials. Optical disk technology is already used at the Library of Congress to reproduce catalog cards for other libraries. An advisory group is studying copyright and royalty constraints as they apply to the new techniques.

OPTICAL DISK PILOT PROGRAM AT THE LIBRARY OF CONGRESS*

*This text is based on an oral presentation made at the preservation conference organized by the Conference of Directors of National Libraries and hosted by the National Library of Austria in Vienna, April 1986. It will appear in the proceedings of that conference to be published by K. G. Saur, Verlag, Munich.

The Library of Congress, like many libraries around the world, faces very serious problems in the area of preservation and conservation of library materials. As a very large library, we also are concerned about improving access to our many collections. We have more than 80 million items in the Library, and we have three very large buildings in Washington, D.C., with specialized reading rooms. The user coming to the Library with comprehensive research interests will have to visit several difference reading rooms and submit requests for materials, just as he would do in any library. So we must look to new technology for solving the needs and meeting the challenges in both preservation and access to library materials. The optical disk pilot program, a project currently under way at the Library, is a good example of the use of new technology in solving modern library problems.

The Library of Congress, late in 1982, let two contracts to private industry, one for videodisc work and one for optical digital disk work. Both are types of optical disk technology. The optical disk pilot program aims to evaluate the use of optical disk technology for information preservation and for information access and management, and to determine if such a system can be put to wider use in the future.

Optical disks involve the recording of information at the wavelength of light by using lasers. Optical storage is desirable for two reasons: Because of high-density recording and high storage capacity, optical disks now permit the efficient storage and retrieval of digitized images; and because the disks are read by reflected light, no wear or image degradation results from their playback.

"Man builds no structure that outlives a book," an often quoted statement made by Eugene Ware about 1898, aids and comforts librarians, but unfortunately has not proven to be true. The brittle book problem is a familiar one. Optical disk technology may offer opportunities for dealing with such difficulties. Our aims in the area of information preservation are to find a stable storage medium, i.e., one that will experience no degradation from physical contact while in use; to be able to monitor electronically the recorded quality of the data on the disks; and to be able to transfer information from one disk to another without the generational loss frequently associated with other forms of storage. With regard to improved access, we of course are interested in random input and access; we provide this already in the Library of Congress, as so many other libraries, in terms of our bibliographic control. This is, however, information about information; now we seek to be able to supply the information itself. The important information we supply must be timely (i.e., as soon after publication as possible) and it must be readily available. We want to provide rapid user access, and with the high storage density of optical disks, we should be able to deliver great quantities of information.

The Optical Disk Pilot Program is divided into two subprojects, the print project, which is concerned with conventionally printed materials; and the non-print project, which deals with special collection materials, primarily visual and sound collections containing some 57 million items.

In the optical disk print project, optical digital technology is used to scan high-use serials and periodicals, government publications, legal materials, manuscripts, printed sheet music, and maps. These forms of information are digitally scanned and conveyed in a black and white form, which also approximates gray scale, and are stored on an optical digital disk designed by the Alcatel Thomson Corporation.

The non-print project, deals with photographic materials, prints and graphics, and motion pictures -- all in both large and small formats; and with television productions and audio materials digitally recorded on compact audio disc. With the assistance of a high-quality photographic firm, 35 mm motion picture color photographs were taken of all these types of materials. This film was then transferred to videotape, from which videodiscs were then mastered and stamped out, much as phonograph records are produced. This process illustrates an important difference between the analog and digital technologies. With the videodisc in use for the non-print project, program materials must be prepared in advance and sent out for mastering in an ultra-clean room environment, whereas with the digital disk used on the print project, the laser recording devices are in our own offices and digital images can be scanned and recorded in-house.

Greater recording density is one of our major hopes. Increasing degrees of miniaturization are possible with various technologies. A book page of 54,000 mm^2 is reduced to 35 mm microfilm, which occupies 150 mm^2, and is then further reduced to microfiche, requiring 70 mm^2 of space, and is eventually reduced to digital optical disk. The same information quantity could then be reduced to a dot, which would measure 3-6 mm^2, if all the bits that represent the page were grouped together. In fact, the digital optical disk image is written out on tracks as streams of bits, similar to the convention used for recording on magnetic disks. Disk capacity can be illustrated in another way. We create 12-inch optical disks and we scan at a rate of 300 lines per inch. This means every inch on the page is scanned 300 times, and the information content is changed into a series of zeros and ones, or binary representation. Our target in this pilot program is to be able to store between 10 and 15 thousand highly resolved images on one side of an optical digital disk. This figure is expressed as a range because of some very specialized circuitry in the system, which enables the compression of the large runs of white and black space into fewer bits for storage and transmission within the system. Therefore, the exact number of pages possible would be greatly dependent upon information that was on the original page. As I mentioned, we are doing this in black and white and in an approximation to half-tone, using a coding process which is only one bit in depth. It is possible to digitize and store fully half-tone images, but far more bits are required for this coding. So the capacity of a disk would be reduced to 500-1,000 pages on one side of the disk for full gray scale. Likewise, one can digitize color, but there, since the number of bits required to represent the images is even larger, only 110 pages could be stored on one side of a disk. We hope these current limitations will be eliminated as this technology matures, but even if the storage requirement for color is greatly reduced, there may be cases where it would still be justifiable to create disks with only a few high-quality digitized color images.

This is not the first use of optical disks at the Library of Congress. We have been pioneering in this field from the beginning. In 1979 we let a major contract to take the many millions of cataloging cards that have accumulated at the Library since 1901, when we began to sell these cards to other libraries. This inventory file of cards has become a major problem. It takes a large number of staff to maintain, and the file itself is always subject to damage. The idea in 1979 was to digitize these card images and then to store them on optical digital disk by using special scanners, and to discard the original cards and print fresh cards on demand. This early project illustrates our current hopes for computer image enhancement as one of the opportunities that digital technology provides. Existing soiled and tattered cards can be reprinted from a stored digital image with all of the soiling removed through digital image enhancement. The irony of using such high technology for printing cards that people must file by hand is, of course, not lost on us, but many libraries around the world still depend on our card sales program. Some of these libraries are so impoverished that they do not have their own rooms or even telephones, much less computers. For this reason we must still pursue the use of this technology for demand-card printing. As a measure of how rapidly optical disk technology is maturing, however, the early optical disk used for the card system is already obsolete and has been overtaken by the newer technologies.

As I mentioned earlier, preservation is one of the two concerns of the Library's optical disk project. The Library of Congress has laboratories in its own facilities for other preservation work, and we hope to establish an optical disk testing and measurement facility also. We will want to measure the quality of the optical disk at two important times. One time is at the very beginning, when we want to ensure that a blank disk is of the highest quality. Then, as I mentioned earlier, we hope to electronically monitor the condition of the disks with the passage of time so we can sense and measure any degradation before it becomes catastrophic, and then, of course, be able to write new copies of the disk. For this project, therefore, in some cases two disks will be created. One disk will be put into service in our juke box system for access purposes, and the other will be subjected to various kinds of long-term and accelerated life-term preservation testing.

The pilot program is of finite duration; we hope it will be completed by October 1988. We will evaluate our findings to judge whether we will benefit from the opportunities of optical disk technology in the future. Results will be published and circulated widely for comment. The opportunities are numerous in many areas -- preservation, service, random access, space compaction, and image enhancement. They will guide us as we move forward in determining how disks can best help preserve library materials and improve library research.

In conclusion, one highly important aspect of optical disk technology must be mentioned, that is, the question of intellectual property ownership, or copyright and royalties. This issue is very important for the future use of such techniques in libraries and publishing concerns around the world. To help us work with this issue, an advisory group of distinguished librarians and members of the publishing community has been assembled to put forward guidelines for us and other libraries to consider for the future.

THE POTENTIAL OF THE INTERACTIVE VIDEODISC FOR INTERNATIONAL COOPERATION AS DOCUMENTED BY PROJECT EMPEROR-I

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THE POTENTIAL OF THE INTERACTIVE VIDEODISC FOR INTERNATIONAL COOPERATION AS DOCUMENTED BY PROJECT EMPEROR-I

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Laser optical videodisc technology harbors great possibilities for information organization, storage, retrieval and transfer. It is unique in that it permits high-density storage of multi-media, multi-formatted, and multi-dimensional information on a single disc. Thus, it will surely revolutionize libraries and their future services.

In regards to international cooperation, the relevant traits of optical videodisc technology will be addressed. However, the ultimate power of the videodisc is only revealed if, in an interactive mode, it is allied with a computer. An online demonstration of the interactive videodisc, "The First Emperor of China", a product of PROJECT EMPEROR-I, will vividly illustrate this.

"PROJECT EMPEROR-I: China's Treasure Revealed via Videodisc Technology", to which the author is the Project Director and Principal Investigator, is supported by the Humanities Project in Libraries, US National Endowment for the Humanities. In its presentation and interpretation of a most significant historical/archaeological period of China's pat, the Project utilizes the most current videodisc technology. The period is that of the First Emperor of China. The artifacts that are recorded and presented include the terra-cotta figures of warriors and horses found near his tomb in Xian.

This project exemplifies the significant role which new technology can play in information sharing. In doing so, it has furthered cross-cultural appreciation, and international cooperation and relationship.

THE POTENTIAL OF THE INTERACTIVE VIDEODISC FOR INTERNATIONAL COOPERATION AS DOCUMENTED BY PROJECT EMPEROR-I

INTRODUCTION

Long before microcomputers, videodisc technology existed. In the 1970s and 1980s, videodiscs were mainly employed for recreational purposes. In recent years, its full potential as a high-density, high-speed information storage and retrieval medium was realized. This realization was due to the rapidly progressing microcomputer industry. For, standing alone, the videodisc has very limited application potential. Yet, when united with a computer, especially low-cost, high-performance micros, the videodisc permits infinite information transfer possibilities. The prevailing use of micro-based videodisc technology for information-related applications illustrates the importance of this marriage.

Videodisc and Its Features

A brief introduction to the basics of videodisc technology will permit a better understanding on the potential possibilities of this technology for information management. The following summary is abstracted from Chen (1985) and several other papers by Chen on PROJECT EMPEROR-I (1985-1986).

Optical videodisc technology is unique in its ability to combine all types of information media into a simultaneous and continuous format. Such information media include, still pictures, meaning both slides and images from filmstrips, and motion pictures, being films or video tapes. In addition to visual images, the videodisc can store stereo audio on dual-sound tracks.

A videodisc can be either analog or digital. A high-density storage medium, an analog optical videodisc stores 54,000 frames of image on a single-sided 12-inch disc. This is equal to the capacity of 675 80-slide carousel trays. When video image are stored, each single-sided disc contains one half-hour video of 30 frames per second and with dual sound tracks. In regards to a 12-inch digital disc, a double-sided disc can store approximately 800 MB of data. Depending upon the actual fineness of the resolution, this is about 10,000 to 20,000 pages of text, or approximately 75 hours of digital sound.

Of great importance is that the videodisc permits frames of images to be read on an individual basis in any identified sequence. In addition, a user may opt to randomly retrieve any specified still image or motion sequence of the 54,000-frame analog disc. The time required for retrieval is less than three seconds. It is also possible to retrieve a combination of still images, motion sequences and/or audio. For a digital videodisc, either the Boolean search and/or the full text search may be performed for information retrieval with specific software.

Optical videodisc technology utilizes a laser for recording and/or reading information. The laser can be focused to an accuracy of one micron or one degree of one millionth of a meter. Such accuracy permits a 12-inch disc to retain information with outstanding high-density inscription. The videodisc's information surface is made up of over 10 billion spiralling tracks per side. These tracks, called pits are of varying lengths.

An average spinning rate of the videodisc is 30 revolutions per second or 1800 revolutions per minute. A photo-detecter collects the light which the laser beam focuses on the disc's surface. Upon striking a pit, the reflected beam is diffracted away from the detector. The video and audio signals are produced by a variation in light intensity, caused by the varying pit lengths (see Figure 1). The videodisc's metallic surface is protected by a layer of plastic. This allows the laser beam to read the information on each disc without actual contact. Thus the stored information is protected from destruction, rarely damaged or lost. It is partially because of this trait, that the videodisc is reputed as being an ideal medium for archival preservation and conservation.

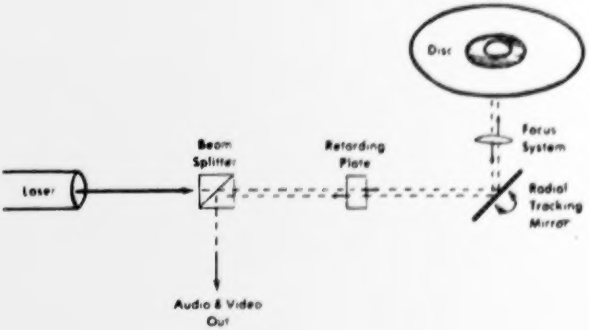

Figure 1. The Simplified mechanics of a reflective optical videodisc system (Taken from Chen, 1985)

For multiple reasons, the videodisc is ideal for information delivery and mass information storage. The first, and often primary reason being its affordability for storing multi-media information. As well, the videodisc's density and versatility permits inexpensive online storage, allowing expedient and random retrieval. Optical videodiscs are ideal for many functions. They are treasured by conservationists for archival storage, as well as by publishers for electronic publishers and database construction. Able to store video images, photographs, drawings, maps, charts, plans, formulas, narration, recordings, videotapings and more, videodiscs are ideal for the development of either audio and/or visual databases. It is thus the perfect storage solution for compact safekeeping of large amounts of multi-media and multi-formatted information. Visual images are clearly presented and preserved because of the videodisc's high color resolution. These most useful traits, make optical videodiscs an ideal solution for spatial, preservation and conservation problems.

To summarize, the versatility and characteristics of the videodisc are:

* High storage capacity,
* Multi-type information integration,
* High resolution and sharp color images,
* Ideal medium for archival and preservation purposes,
* Fast random access, and
* Interactive capability with computer systems.

Thus the optical videodisc is an ideal medium for uniting technology with scholarship; subject specialities with high technology; and education and training with research and demonstration. The great promise videodisc's hold for international library development and cooperation, as well as information transfer and dissemination is revealed via PROJECT EMPEROR-I.

Interactive Videodisc

Even though the videodisc is highly acclaimed for the above characteristics, its true potential can only be realized in an interactive mode. Prerequisite to understanding this, is an understanding of just what is meant by an interactive mode. An interactive system is one in which a simultaneous and reciprocal interchange occurs between the user and the system. A prime example of such a system is human conversation. The key words here are simultaneity and interruptability. An interactive optical videodisc system depends on the viewer playing an essential role in the system. The system relies on the easily and randomly-accessed analog disc being connected to a computer system, specifically a microcomputer. By employing computer programs a system user may retrieve any of the visual and audio information contained on the analog disc and the textual information on the connected computer. Thus, the system user is intimately involved in the viewing/learning process, rather than merely being a passive observer.

The interactive videodisc system exemplifies the successful union of the computer with the audio, textual and visual information of the videodisc. The disc's allowance for easy information access, permits the development of a range of courseware with user-friendly menu-driver choices. Another factor is the variety of sophisticated course authoring software available in today's marketplace. The developed courseware offers the user options regarding the availability of information, be it on the disc or in the computer.

Possessing characteristics which enhance easy information access and information sharing, the interactive videodisc, such as those of PROJECT EMPEROR-I, encourages appreciation of such subject matters as the humanities, as shown through actual demonstration. The discs have also made a valuable contribution to better international cooperation and relationship, and upgrade the general quality of life.

PROJECT EMPEROR-I

PROJECT EMPEROR-I: China's Treasure Revealed via Videodisc Technology employs the most current videodisc technology in order to present and interpret a major historical/archaeological period of China's past. The US National Endowment for the Humanities' Humanities Project in Libraries provides the needed support for this vivid presentation of the artifacts of the First Emperor of China (Qin Dynasty). The Emperor reigned for only fifteen short years. His accomplishments were many - the unification of warring states, the completion of the Great Wall, the institution of unified written scripts, and the construction of his spectacular tomb near Xian. Next to this tomb the 7,000 life-size terra-cotta figures of warriors and horses were found (see Figure 2). Throughout the world, people have been captivated by this most magnificent and significant archaeological discovery. Utilizing an interactive videodisc, PROJECT EMPEROR-I presents and interprets these intricate and amazing subjects.

Figure 2 Qin Terra-Cotta Figures of Warriors.
and Horses (Courtesy of PROJECT EMPEROR-I)

Project Objectives

PROJECT EMPEROR-I illustrates how the videodisc can be used as a serious medium for large-scale multi-media information storage, processing and retrieval. It also weakens the division between new communications technologies and humanistic applications. In doing this, PROJECT EMPEROR-I provides a unique union of East and West, past and present, humanities and high technology, as well as scholarship and application. The result, which is vividly illustrated by PROJECT EMPEROR-I is the employment of a progressive technique for the presentation of multi-media, multi-formatted, and multi-dimensional information. Further is the enhancement of international cooperation via an increased understanding and appreciation for the humanities. Additionally is the excitement of unveiling a novel interactive educational and learning tool with visual, audio, and textual information, which is provided by means of a videodisc united to developed courseware and utilized with a micro-based system.

PROJECT EMPEROR-I's Products

1. "The First Emperor of China" videodiscs

Two double-sided 12" NTSC CAV videodiscs are the main products of PROJECT EMPEROR -I. Entitled "The First Emperor of China: Qin Shi Huang Di, 秦始皇帝 ", each disc is constructed of 108,000 frames of visual images along with musical interludes. As well is one full-hour of narration and/or interviews which are recorded in both Chinese and English.

As in an electric book, the visual information is organized on the disc in groups. Specifically, all visual information is matched with appropriate bilingual narrations, which are than classified into "chapters". A specific theme is the focus of each chapter. For example, "Introduction on the First Emperor of China", "The Great Wall", and "The Qin Terra-Cotta Museum of Warriors and Horses". Swift retrieval of both the audio and visual information on a thematic topic is encouraged via this format. In addition, any one of the 108,000 frames of visual images is easily and randomly retrievable in less than three seconds.

The discs are not meant to be stand-alone ones, yet, the above-mentioned three chapters are self-contained introductory programs. In addition to these, the first disc also contains over two hundred segments of motion video and over four thousand still frame pictures.

The second disc is also double-sided and is composed of much valued oral history on this topic. Further, videotaped interviews present a historical perspective. Interviews and insights from ten of the field's most respected experts, totalling over 60 hours were critically selected and edited for inclusion. Those which were selected, are included on the second disc in the format of questions asked of and responded to by each expert. Once again the method of chapters is employed for organizing the answers provided to each question by the experts. It too may be retrieved randomly in three seconds.

2. Electronic Database

For the most significant visual images of the videodisc an extensive database is being developed on a micro-based system by using a relational database management software specifically oriented for the retrieval of visual information. Each record is to be made up of approximately twelve fields. The fields will include disc side number, frame number, type of object, date of object, size of object, material of object, date of discovery, site where discovered, current location of object, information source, publication source, and comments. When the database information is used conjunctively with the videodisc, one will be able to interactively and simultaneously retrieve specific textual and visual data by means of a micro-based interactive videodisc system.

3. Courseware

With a hardware grant from the Digital Equipment Corporation, the DEC IVIS (Interactive Video Information System) has been used to develop a variety of computer-assisted instructional courseware. The hope in developing these courseware is to meet the needs of users with varying degrees of knowledge in both the fields of Chinese art history and archaeology. Currently three levels are considered. They are the intelligent laymen and school students, college students studying Chinese art history and archaeology, and graduate students and researchers in the field. For each level of audience, computer-assisted instructional lessons are being developed using Videologic's authoring software, DIRECTOR.

Each lesson will enable the system user to interactively choose the options given as menus and sub-menus on the monitor screen provided for selection making. By means of these menus and sub-menus, a user will be progressively led through each lesson with simultaneous and selected visual, audio and textual information in any combinations specified. In addition to topical and sub-topical choices (Figure 3), the main menu also includes various other options which include the following:

* Exploration - choices to view three-dimensional pictures or to browse through slide collection by going forward, backward, zooming in, zooming out, etc.

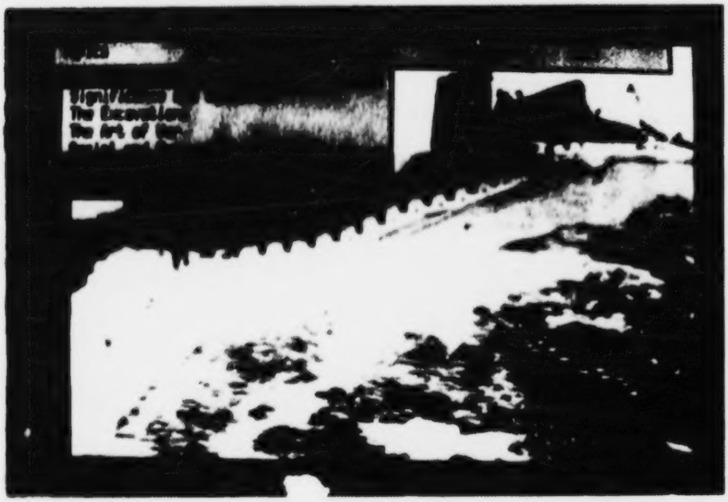

Figure 3. A typical menu showing the possible topical choices

* Reference - selection for checking in the "glossary" file or for viewing the "bibliography" file. Some items included in the bibliography can also be retrieved and viewed in full-text form.

* Announcements or messages.

It is expected that these coursewares will also be transported to IBM and IBM-compatible micro-based systems. Concurrently, since PROJECT EMPEROR-I is an R&D project, experiments with other authoring software are also ongoing so that various types of courses can be developed as well.

CONCLUSION

The humanities orientation of PROJECT EMPEROR-I has played a significant role in the tremendously successful achievement of the project objectives. Both laypersons and field specialists have benefited from such a technology-related product. By means of videodisc technology, with its capacity for instantaneously and easily retrieved, multi-media data and information and simultaneous spectacular visual images, many have been able to witness and appreciate a magnificent Chinese treasure in a way even more superior in many ways than being personally on site. To those who might never be able to visit China, the wonderful period of Chinese history on the First Emperor of China has come alive through multimedia, because this disc has treated the viewers to scenes reminiscent of the Twilight Zone. Thus, PROJECT EMPEROR-I has displayed how the new information technology can even merge with something ancient, and if applied in a particular manner can indeed contribute to mass appeal of the humanities and better international understanding and cooperation among mankind.

While PROJECT EMPEROR-I has demonstrated this possibility vividly, the project has emerged also as a perfect research and development project for promoting the tremendously exciting opportunities of the interactive videodisc as a wide-ranging educational and experimental tool in the new wave of interactive learning and education. It should have much wider and broader implications for all professionals to whom "information" is a common word.

In an even more general sense, videodisc technology can be an universal tool for all of us and is expected to have a very positive influence in the future of information provision. It can provide information access insensitive of time limitation, distance, volume or complexity in a way impossible for us to contemplate before. This is the kind of dynamic and agressive library services and information provision which we as informational professionals in this information age should develop and strike for.

PROJECT EMPEROR-I is one attempt for the development of the new frontier in utilizing new information technology and in working with other professions for information development and cooperation. While the process and tasks involved have been difficult and at times frustrating, the experience and results have been most exciting and gratifying.

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ALIS - THE ONLINE PUBLIC ACCESS UNION CATALOGUE AND DOCUMENT ORDERING SYSTEM OF THE SCANDINAVIAN CENTRAL LIBRARIES OF TECHNOLOGY

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ALIS - THE ONLINE PUBLIC ACCESS UNION CATALOGUE AND DOCUMENT ORDERING SYSTEM OF THE SCANDINAVIAN CENTRAL LIBRARIES OF TECHNOLOGY

Bent Barnholdt

The National Technological Library of Denmark

The National Technological Library of Denmark (DTB) established in 1979 the online public access catalogue ALIS comprising the holdings of DTB and some other Danish technological libraries. On the initiative of the Scandiaplan Special Committee for Technology the ALIS catalogue was during 1985-86 extented to a union catalogue comprising all machine readable catalogue records from the Scandinavian central libraries of technology. The present ALIS union catalogue of technology and its basic sciences consists of two main bases: SMOT (Scandinavian Catalogue of Monographs on Technology) and SPOT (Scandinavian Catalogue of Periodicals on Technology).

The ALIS catalogue system includes an electronic document ordering mailbox. All users have thus the possibility of not only searching the Scandinavian Union Catalogue of technology and its basic sciences but also making online orders for loans or photocopies of the literature found. Regarding the holdings of DTB the system furthermore enables the user to get information about the actual status of the items found by the system ("on shelf", "on loan", or "on reservation").

ALIS - THE ONLINE PUBLIC ACCESS UNION CATALOGUE AND DOCUMENT ORDERING SYSTEM OF THE SCANDINAVIAN CENTRAL LIBRARIES OF TECHNOLOGY

INTRODUCTION

In the late sixties the National Technological Library of Denmark (DTB) developed a batch system for edp-produced library catalogues (ref. 1). The system was put into daily operation during 1968-69. The master file of this machine readable catalogue comprises all books, dissertations, serials, reports etc. with printing year 1968 or later, which have been procured and processed in DTB. The catalogue also contains titles and holdings information for all DTB's periodicals (appr. 12.000) and the annually updated catalogue "Dansk List-Tech" comprising current serials titles within science and technology held by some seventy Danish university and institutional libraries. Since 1975 all conference proceedings accessioned not only by DTB, but by all the other technological central libraries in the North (Gothenburg, Helsinki, Stockholm and Trondheim) have been registered in the machine readable catalogue (ref. 2). Finally, as part of DTB's cooperation with the libraries of the Danish technological schools, the collections of Soenderborg and Aarhus Technological Libraries have been registered.

Until the end of 1978 this machine readable catalogue was exclusively used for production of traditional catalogues printed on paper (book form) or made on COM-film/COM-microfiche (COM = Computer Output Microform). DTB wished, however, to make these catalogue data available to the general public in a more flexible and user-friendly way than it had so far been possible with the traditional catalogues.

With this objective in mind DTB has in cooperation with I/S Datacentralen af 1959 (DC) and with financial support from the Danish Council for Scientific and Technical Research and NORDDOK (now: NORDINFO) established an information processing system ALIS (=Automated Library Information System). This online public access catalogue was put into daily operation in January 1979.

The catalogue search part of ALIS makes it possible for the user via VDUs (Visual Display Units) or typewriter terminals to search for literature in DTB's data base using as access points names of authors, titles or keywords in titles, subject, UDC-numbers (UDC = the Universal Decimal Classification System), ISBN (ISBN = Standard Book Number), ISSN (ISSN = International Standard Serial Number), CODEN, language codes, year of publication or combinations of these choices. Coincident with the presentation of the bibliographic data, information is given as to which libraries are registered as owners of the retrieved publication. Thus the user is immediately given information as to where the retrieved publications may be ordered as loans or as copies.

As a result of the successful experiences with the ALIS online catalogue for DTB, other Danish libraries with machine readable data have placed their catalogues in the ALIS system as separate bases. Furthermore, it should be mentioned that the Scandiaplan Special Committee for Technology has decided to include among the ALIS databases an online catalogue comprising all machine readable records from the Scandinavian central libraries of technology Gothenburg, Stockholm, Trondheim Helsinki). This Scandinavian union catalogue of science and technology was established during 1985 and will consist of two bases: SMOT (Scandinavian

Catalogue of Monographs on Technology) and SPOT (Scandinavian Catalogue of Periodicals on Technology).

At the same time as the number of data bases in ALIS was increased, a circulation control system for DTB was developed taking care of both the daily lending routines and the gathering of statistics analyzing the utilization of the library's collection with a view to an optimization of resource allocations for the various types of literature and subject areas.

This circulation control system, based on bar code registration of the publications and the borrowers, has been in daily operation since October 1983. Moreover, a document ordering module was developed and put into operation in December 1981, relating to the DTB holdings represented in the ALIS data bases. Later (April 1985) this document ordering facility was expanded to the present ALIS mail box system enabling the users to order loans or photocopies of all literature from all library catalogues in the ALIS system.

SYSTEMS STRUCTURE

The two above mentioned main functions of ALIS - catalogue searching and circulation administration - are not established as two independent functions, because an important facility in a literature localization system is the user's prospect of learning directly whether a retrieved publication from the search system is immediately available or not; i.e., the catalogue system must be able to "look into" the circulation system.

A prerequisite for the solution of the two main functions and their coupling has, furthermore, been that the functions should be based on an online system. Thus one basic element is a base with advanced retrieval facilities. The other basic element is an online circulation system whose basic information about publications is based on the machine readable cataloguing of the holdings of DTB.

Systemwise, ALIS is a distributed system divided into subsystems placed on various hardware communicating among themselves.

The maintenance of the search data base is carried out at I/S Datacentralen af 1959 (DC). The base is placed in the general freetext search system DC-INFO, which is a DC host centre interface to BRS/SEARCH. This system is generally used for search data bases among which one can access the set of bases constituting ALIS. The ALIS bases are updated daily in connection with DTB's edp-cataloguing.

DC-INFO/BRS/SEARCH is placed under the control system CICS which communicates according to 3270-protocol via the networks to DTB. The distributed part of ALIS is conceived as two control units with a number of terminals attached to each of them (see fig. 1).

A double TI 990/12 computer installation is placed at DTB. This TI-installation has two main functions. One is to take care of circulation administration with regard to online charging, discharging, reservation etc., and the other is to communicate with the central system on one side (3270) and with the terminals on the other (TTY).

In connection with the display of information from a catalogue record it is also possible to communicate with the circulation system. It is possible to ask for the status of a publication if it belongs to DTB.

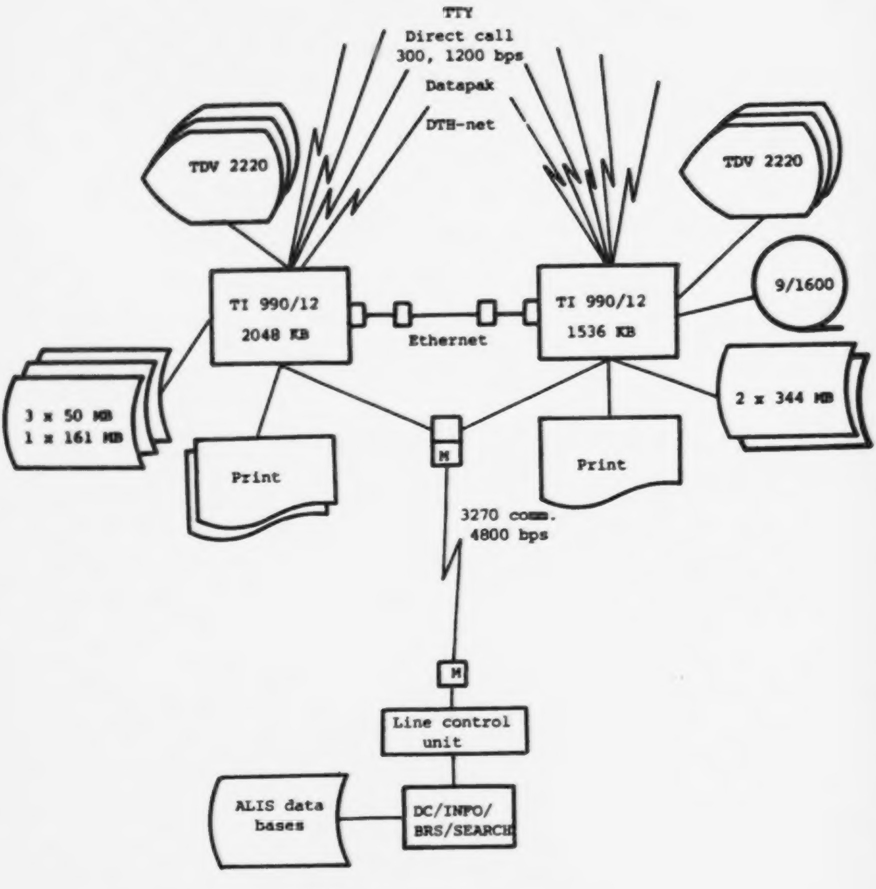

TTY
Direct call
300, 1200 bps
Datapak
DTH-net
TDV 2220
TDV 2220
TI 990/12
2048 KB
TI 990/12
1536 KB
9/1600
Ethernet
3 x 50 MB
1 x 161 MB
2 x 344 MB
Print
Print
M
3270 comm.
4800 bps
M
Line control unit
ALIS data bases
DC/INFO/
BRS/SEARCH

Fig. 1. ALIS system configuration

HARDWARE CONFIGURATION AND USERS EQUIPMENT

The catalogue search part of ALIS is placed in an IBM 3084 installation at the computer service bureau I/S Datacentralen af 1959 situated about 15 km from the premises of DTB.

This installation is connected to a local minicomputer installation in DTB by an IBM 3270 communications line (leased telephone line) with signal rate 4800 bps.

The local minicomputer placed in DTB consists of a Texas Instruments TI 990/12 computer with 2048 KB memory and a TI 990/12 computer with 1536 KB memory. The two minicomputers are connected by an ethernet linkage. The local installation comprises also three 50 MB-disk units, one 160 MB unit and two 344 MB units.

ALIS users can access the system by direct call via telephone lines (300 or 1200 bps, full duplex, even parity) or via the public packet switching network DATAPAK (X.25, signal rate transparent). All TTY compatible VDU's or typewriter terminals can be used.

SOFTWARE AND FILE STRUCTURE

The catalogue search part of ALIS is placed in DC-INFO, the online freetext information retrieval system of Datacentralen. This interactive search system enables the users to find and display bibliographic records. Commands, search terms, operators, and qualifiers are entered by the user. System messages or bibliographic records are written by the system on the local VDU terminal or on a central printer.

DC-INFO is the DC host centre interface to the basic search system BRS/SEARCH. This interface contains several functions, which normally are not available to BRS/SEARCH users, e.g. the possibility of using CCL (Common Command Language), instead of the BRS/SEARCH dialogue commands. The DC-INFO software also permits operation on an arbitrary number of data bases under one label. The DC-INFO software can be characterized by the following key figures:

- core requirements: max. 791 Kbytes for program + min. 19 Kbytes per active user (normally 25 - 30 Kbytes)
- 70 - 80.00 assembler statements
- 250 - 300 programmes
- approximately 10.000 bytes disk space per user in the user file (the user profile data set)

Concerning the mainframe BRS/SEARCH software product descriptions are obtainable from BRS (Bibliographic Retrieval Services, Inc., Lathan, N.Y.).

Regarding the local mini-computer installation software, it should be mentioned that by extensive use of standard facilities in TI operative systems, a customer-designed data base management system has been constructed. There is multi-access to functions, which are represented in the system by one programme per function. The programmes have been written in FORTRAN, and the modular code is equipped with extensive comments. The programmes are operating on a multi-key indexfile system and the logical registers are, as a main rule, complemented by a physical file.

The most important files are named as follows:

1 Bar code register
2 Title register
3 Borrower register
4 Loan register
5 Reservation register

On each file, there are records with data fields and so-called secondary keys accessible for online updating.

The primary key in each record is a unique key which cannot be updated in one step. If changes to primary key occur, you therefore have to delete the record and create a new one. Access points to records are either primary or secondary keys.

The contents of each file are summarized below:

Bar code register: Bar code number (primary), registration number (secondary), issue information (secondary), status information (whether on shelf or not) (data).

Title register: Registration number (primary), publication type (data), title (data), location (data), creation date (data), owner of publication (other libraries) (data).

Borrower register: Borrower number (primary), borrower's bar code (secondary), category (data), status (data), creation date (data), date of status changes (data), name (secondary), c/o name (secondary), address (data), phone number (data), DC-code number (secondary), user level code (data).

Loan register: Borrower number (primary), temporary information about borrower (data), registration number (secondary), issue information (secondary), bar code number (secondary), method of delivery (data), date of borrowing (data), date of delivery (data), claiming status (data).

Reservation register: Borrower number (primary), temporary information about borrower (data), registration number (secondary), issue information (secondary), status for postal messages (data), method of delivery (data), date of reservation (data), last date of interest (data).

Finally, it should be mentioned that automatic reorganization and log facilities are available, and furthermore, that security copies of system and files are stored both on disc and tape.

For a more detailed description of the circulation control part of ALIS see ref. 3.

FUNCTIONS AND SERVICES

a) The catalogue search part

Online: DC-INFO contains a broad set of user profile parameters. The user profile will always originally be defined with CCL-commands, operators and qualifiers. A list of CCL-command words is shown in fig. 2.

If the user for one reason or another should decide to change the basic definitions, this can be done with the command DEFINE.

A search session can be described as an iteration of the following actions:

Original CCL-command	Default abbrev.	Description of function	Examples
BACK	B	to display previous records and/or pages	B <CR>
BASE	BAS	to select and/or change a base to survey bases	BAS basename <CR> BAS <CR> or BAS? <CR>
DEFINE	DE	to redefine default values of commands, operators, promptmode etc. or to give overview of user's settings	DE f/find <CR> DE and/+ <CR> DE PROMPTS=LONG <CR> DE <CR>
DELETE	DEL	to delete the previously performed searches	DEL ALL <CR>
DISPLAY	D	to display a list of alphabetically related words	D word <CR>
FIELDS	FIELDS	to display a survey of fields in the chosen base	FIELDS ? <CR>
FIND	F	to enter a searchargument and receive a result in terms of how many records fulfil the searchargument to list previous searches	F searchargument <CR> F ? <CR>
?	?	to receive system aids of a general kind syntactical kind or actual use	? <CR> ? F <CR> F ? <CR>
INFO	INFO	to obtain statusinformation on the current session such as connect time used etc.	INFO COST <CR>
MORE	M	to display subsequent records and/or pages	M <CR> or simply <CR>
NEWS	NEWS	to receive general information on DC host centre	NEWS <CR>
PRINT	P	to print records offline or local. default is offline print. Temporary setting of local print resetting	P S=x;F=n;R=1 TO 53<CR> DE 5 1=LOCAL<CR> DE 5 1=OFFLINE<CR>
RESET	RESET	to define users own commandset as CCL commands in abbreviated form	RESET CCL<CR>
SHOW	S	to display records at the terminal	S S=x;F=n;R=y<CR>
STRING-SEARCH	ST	to scan a retrieved set of records for a specific string of text. Only possible after a SHOW command	ST string of text <CR>
SORT	SORT	to reorder retrieved records	SORT S=1;(TI,A,10)<CR>
STOP	STOP	to end a search session to end a session and saving the search strategy for the next logon	STOP <CR> STOP BUT<CR>

Fig. 2. ALIS CCL command words

- selection of data base(s)
- formulation of queries, searching and reading of the search result (i.e. the amount of hits)
- specification of display formats, which fields to be seen from the records, and reading of the bibliographic records.

The sequence of actions is typically not foreseen beforehand, except for the first act. You always have to select a database before doing searches.

The actions are performed either by a series of minor steps, one command with a result, or as it is possible in DC-INFO/CCL, a comprehensive stacking of commands. In one transaction it is possible to select a data base, formulate a query, specify display formats and order the first records from a set to be displayed.

During the formulation of a query, the task for the user is to choose search terms, representative of the subject searched for, and to combine them logically. Search terms combined logically with AND, OR, NOT, SAME, WITH, XOR operators are defined as a search statement.

Titles or single words of titles, author names, UDC-numbers or other occurring classification (DDC or LC classification), ISBN, ISSN, CODEN, language codes, year of publication, library codes, controlled terms or uncontrolled terms can be used as search criteria in all possible combinations. All search terms can be spelled out in full, or truncation can be done. The system allows both right-hand and left-hand truncation, but so far only right-hand truncation has been implemented in the ALIS bases.

Besides the usual Boolean operators, the search system also allows range searching; e.g. , searching for books with publication year between 1972 and 1983.

All search statements are stored to enable the end user to execute the same search again. The search statements can be executed on the database in which they were originally entered, or on a different database, without retyping the search. It is also possible to save search statements for a later session. There are, furthermore, facilities for sorting the search results.

In addition to the CCL commands, a set of local commands has been developed enabling the users to get information about the status of those publications which belong to DTB. This publication status command initiates a communication into the files of the circulation system and retrieves information about library holdings of the publication in question, the number of items on loan, and possible reservations.

Another facility pertaining to the search part of ALIS is the mail box function, which concerns all publications from every library catalogue represented in ALIS. This request command starts a dialogue with the user in order to get the necessary information (for example: author name, issue number and page number in case of ordering a paper from a periodical, whether reservation of the publication is desired, etc.) and stores this information together with the bibliographic information on a set of files in the circulation part, each file dedicated to one of the eleven mail box libraries in ALIS. Each of these files can be emptied by the circulation staff of the library in question, and the requests executed. See figs. 3-4.

Offline: Centrally produced prints of the search results can be ordered from the user terminals.

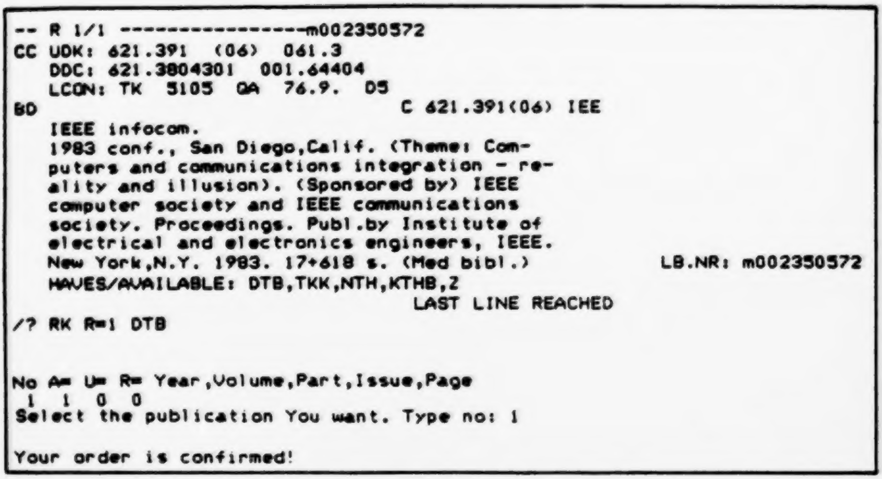
b) Circulation control part:

The ALIS circulation control system handles both the daily lending routines and the gathering of statistics analyzing the utilization of the library's collections, with a view to an optimization of resource allocation for the various types of literature and subject areas.

The basic data in the circulation control system are information about borrowers on the one hand, and information about items in circulation on the other. The primary purpose of the circulation control is to maintain control of lending, return, and reservation links between a borrower and one or more publications, or between more borrowers and one publication. In ALIS, this administration is carried out in a succession of interactive edp-programmes, in which the library staff has direct access to create, alter, or delete basic data, such as borrower- and publication information, and relations between them.

Apart from the irregular routines carried out in the online part, the circulation administration also contains scheduled functions; for example, the statistical analyses mentioned above, or weekly/daily print-outs such as overdue notices, messages about reservations, etc.

These functions are realized in the ALIS circulation part as a series of batch-programmes, that, as the name implies, treat groups of transactions and carry out sequential run through of registers. For a more detailed description of the ALIS circulation control system, see ref. 3.



```
-- R 1/1 ----------------m002350572
CC UDK: 621.391  (06)  061.3
   DDC: 621.3804301  001.64404
   LCON: TK  5105  QA  76.9.  D5
BD                              C 621.391(06) IEE
   IEEE infocom.
   1983 conf., San Diego,Calif. (Theme: Com-
   puters and communications integration - re-
   ality and illusion). (Sponsored by) IEEE
   computer society and IEEE communications
   society. Proceedings. Publ.by Institute of
   electrical and electronics engineers, IEEE.
   New York,N.Y. 1983. 17+618 s. (Med bibl.)        LB.NR: m002350572
   HAVES/AVAILABLE: DTB,TKK,NTH,KTHB,Z
                                LAST LINE REACHED
/? RK R=1 DTB


No A= U= R= Year,Volume,Part,Issue,Page
 1  1  0  0
Select the publication You want. Type no: 1

Your order is confirmed!
```

Fig. 3a

Example of online ordering ("requisition").

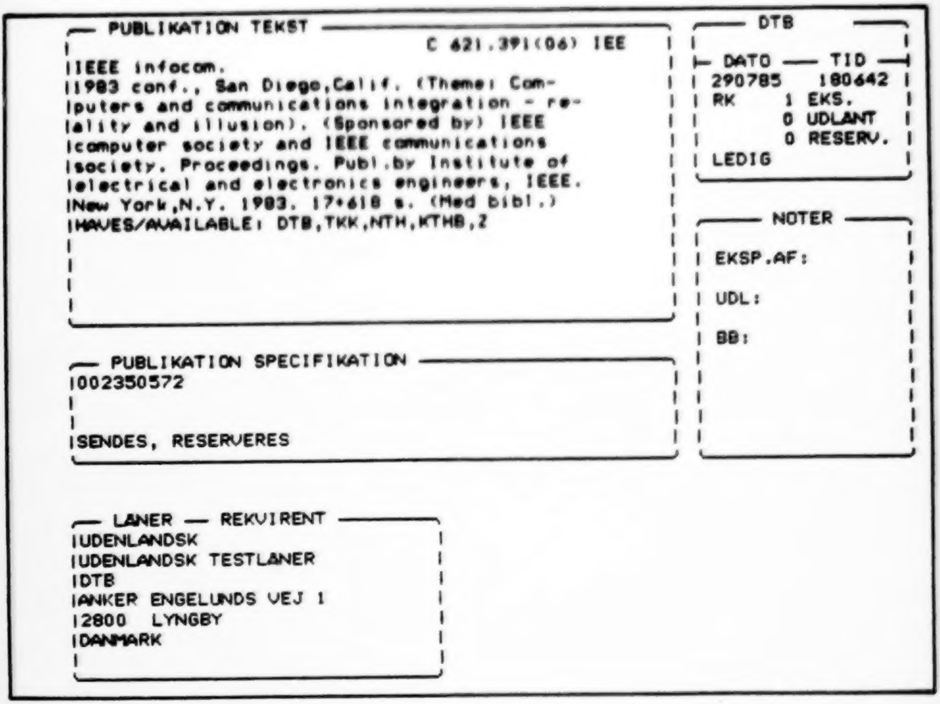
The simple requisition command RK is used to order loan of a monograph found in an ALIS database.

RK R=1 DTB tells the system to order record no.1 from the latest hit list from library "DTB".

A=1 indicates the number of copies owned by DTB.

U=0 indicates the number of copies, which are on loan at the moment.

R=0 Indicates the number of reservations at the moment (U=0 will of course always result in R=0).



```
PUBLIKATION TEKST
                                     C 621.391(06) IEE
IEEE infocom.
1983 conf., San Diego,Calif. (Theme: Com-
puters and communications integration - re-
ality and illusion). (Sponsored by) IEEE
computer society and IEEE communications
society. Proceedings. Publ.by Institute of
electrical and electronics engineers, IEEE.
New York,N.Y. 1983. 17+618 s. (Med bibl.)
HAVES/AVAILABLE: DTB,TKK,NTH,KTHB,2
```

```
DTB
DATO      TID
290785    180642
RK      1 EKS.
        0 UDLANT
        0 RESERV.
LEDIG
```

```
NOTER
EKSP.AF:
UDL:
BB:
```

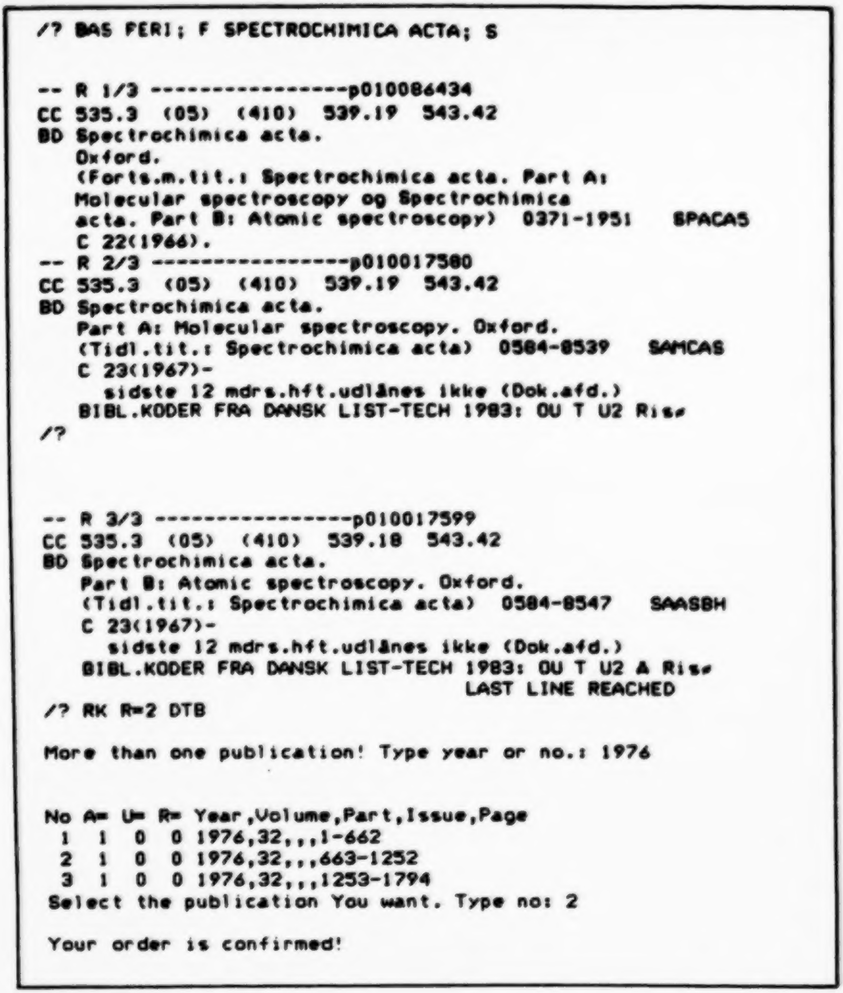
```
PUBLIKATION SPECIFIKATION
002350572


SENDES, RESERVERES
```

```
LANER — REKVIRENT
UDENLANDSK
UDENLANDSK TESTLANER
DTB
ANKER ENGELUNDS VEJ 1
2800   LYNGBY
DANMARK
```

Fig. 3b

The online ordering illustrated in fig. 3a causes, that the ALIS mail box system produces a requisition form as shown here.



```
/? BAS PERI; F SPECTROCHIMICA ACTA; S

-- R 1/3 -----------------p010086434
CC 535.3 (05) (410) 539.19 543.42
BD Spectrochimica acta.
   Oxford.
   (Forts.m.tit.: Spectrochimica acta. Part A:
   Molecular spectroscopy og Spectrochimica
   acta. Part B: Atomic spectroscopy) 0371-1951   SPACAS
   C 22(1966).
-- R 2/3 -----------------p010017580
CC 535.3 (05) (410) 539.19 543.42
BD Spectrochimica acta.
   Part A: Molecular spectroscopy. Oxford.
   (Tidl.tit.: Spectrochimica acta) 0584-8539   SAMCAS
   C 23(1967)-
     sidste 12 mdrs.hft.udlånes ikke (Dok.afd.)
   BIBL.KODER FRA DANSK LIST-TECH 1983: OU T U2 Risø
/?



-- R 3/3 -----------------p010017599
CC 535.3 (05) (410) 539.18 543.42
BD Spectrochimica acta.
   Part B: Atomic spectroscopy. Oxford.
   (Tidl.tit.: Spectrochimica acta) 0584-8547   SAASBH
   C 23(1967)-
     sidste 12 mdrs.hft.udlånes ikke (Dok.afd.)
   BIBL.KODER FRA DANSK LIST-TECH 1983: OU T U2 A Risø
                                        LAST LINE REACHED
/? RK R=2 DTB

More than one publication! Type year or no.: 1976

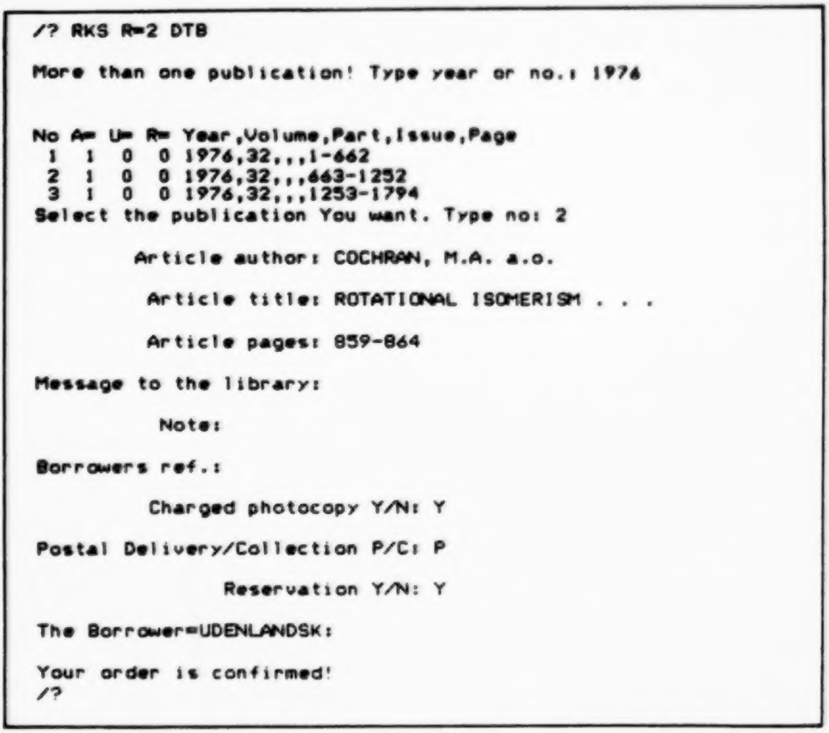

No A= U= R= Year,Volume,Part,Issue,Page
 1  1  0  0 1976,32,,,1-662
 2  1  0  0 1976,32,,,663-1252
 3  1  0  0 1976,32,,,1253-1794
Select the publication You want. Type no: 2

Your order is confirmed!
```

Fig. 4a

Example of online ordering.

The simple requisition command RK is used to order loan of a periodical found in an ALIS database.



```
/? RKS R=2 DTB

More than one publication! Type year or no.: 1976


No A= U= R= Year,Volume,Part,Issue,Page
 1  1  0  0 1976,32,,,1-662
 2  1  0  0 1976,32,,,663-1252
 3  1  0  0 1976,32,,,1253-1794
Select the publication You want. Type no: 2

       Article author: COCHRAN, M.A. a.o.

        Article title: ROTATIONAL ISOMERISM . . .

        Article pages: 859-864

Message to the library:

         Note:

Borrowers ref.:

        Charged photocopy Y/N: Y

Postal Delivery/Collection P/C: P

             Reservation Y/N: Y

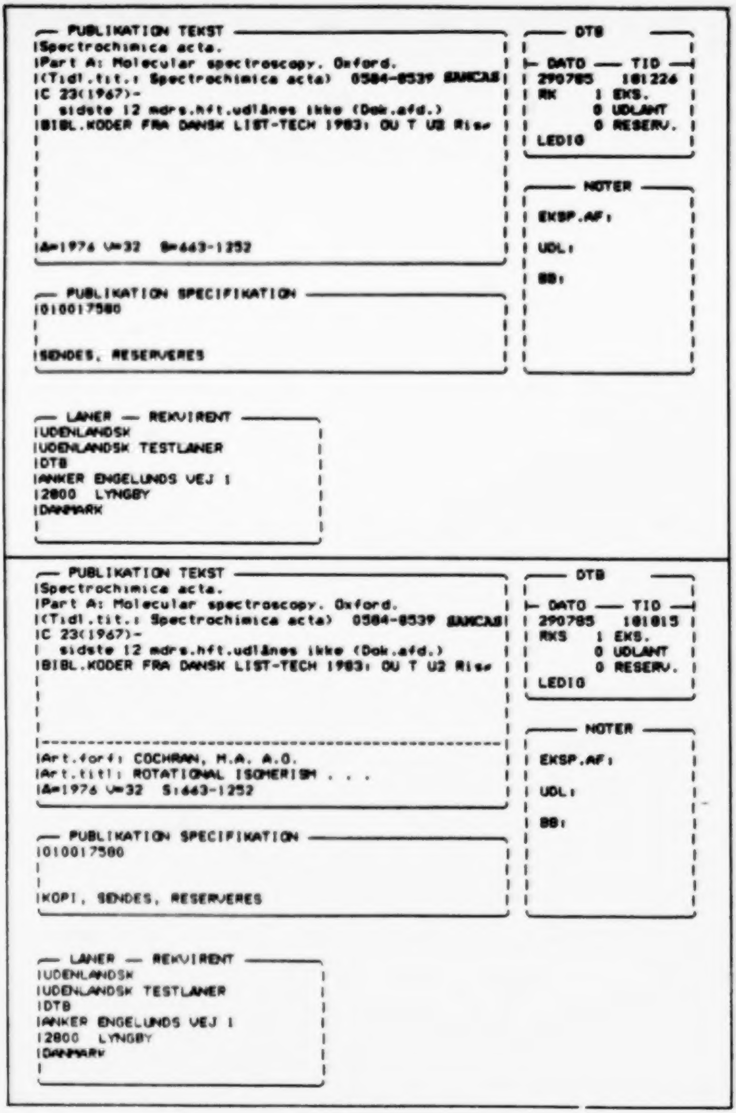
The Borrower=UDENLANDSK:

Your order is confirmed!
/?
```

Fig. 4b

Example of online ordering.

The requisition command RKS is used to order photocopy of a paper in a periodical localized to DTB.



```
— PUBLIKATION TEKST ———————————————————————————————     ——— DTB ———
|Spectrochimica acta.                              |     |              |
|Part A: Molecular spectroscopy. Oxford.           |     |- DATO —— TID -|
|(Tidl.tit.: Spectrochimica acta)  0584-8539 DANCAS|     | 290785  181226 |
|C 23(1967)-                                       |     | RK     1 EKS.  |
|  sidste 12 mdrs.hft.udlånes ikke (Dok.afd.)      |     |        0 UDLANT|
|BIBL.KODER FRA DANSK LIST-TECH 1983: OU T U2 Risø |     |        0 RESERV.|
|                                                  |     | LEDIG          |
|                                                  |
|                                                  |     ——— NOTER ———
|                                                  |     |              |
|                                                  |     | EKSP.AF:     |
|A=1976 V=32  S=443-1252                           |     |              |
                                                         | UDL:         |
— PUBLIKATION SPECIFIKATION ———————————————————————     |              |
|0100017580                                        |     | BB:          |
|                                                  |     |              |
|                                                  |     |              |
|SENDES, RESERVERES                                |     |              |

— LANER — REKVIRENT ————————
|UDENLANDSK                |
|UDENLANDSK TESTLANER      |
|DTB                       |
|ANKER ENGELUNDS VEJ 1     |
|2800  LYNGBY              |
|DANMARK                   |
|                          |
```

```
— PUBLIKATION TEKST ———————————————————————————————     ——— DTB ———
|Spectrochimica acta.                              |     |              |
|Part A: Molecular spectroscopy. Oxford.           |     |- DATO —— TID -|
|(Tidl.tit.: Spectrochimica acta)  0584-8539 DANCAS|     | 290785  181815 |
|C 23(1967)-                                       |     | RXS    1 EKS.  |
|  sidste 12 mdrs.hft.udlånes ikke (Dok.afd.)      |     |        0 UDLANT|
|BIBL.KODER FRA DANSK LIST-TECH 1983: OU T U2 Risø |     |        0 RESERV.|
|                                                  |     | LEDIG          |
|                                                  |
|                                                  |     ——— NOTER ———
|--------------------------------------------------|     |              |
|Art.forf: COCHRAN, H.A. A.O.                      |     | EKSP.AF:     |
|Art.titl: ROTATIONAL ISOMERISM . . .              |     |              |
|A=1976 V=32  S:443-1252                           |     | UDL:         |
                                                         |              |
— PUBLIKATION SPECIFIKATION ———————————————————————     | BB:          |
|0100017580                                        |     |              |
|                                                  |     |              |
|                                                  |     |              |
|KOPI, SENDES, RESERVERES                          |     |              |

— LANER — REKVIRENT ————————
|UDENLANDSK                |
|UDENLANDSK TESTLANER      |
|DTB                       |
|ANKER ENGELUNDS VEJ 1     |
|2800  LYNGBY              |
|DANMARK                   |
|                          |
```

Fig. 4c

This figure shows the ALIS mail box requisition forms produced as result of the online ordering illustrated in fig. 4a and 4b respectively.

TELECOMMUNICATIONS

The ALIS minicomputer installation is - beside the communication line to the mainframe installation at Datacentralen - connected to the PTT telephone network, the public packet switching (X.25) network and the local university network ("DTH-net"). The networks regard the ALIS minicomputer installation as a host and the ALIS minicomputer installation regards the networks as TTY-terminals.

DATABASES IN ALIS

As shown in figure 5 there are 12 physical databases in operation in ALIS as from the middle of 1986.

a) Catalogue databases.

11 of these bases are library catalogues of 10 different Scandinavian research libraries covering science and technology domains. These libraries are listed below with the codes used in the catalogue records:

Denmark: The National Technological Library of Denmark (DTB)
The Copenhagen University Library, Scientific and Medical Department (UB2)
The Danish Veterinary and Agricultural Library (DVJB)

Finland: The Helsinki University of Technology Library (TKK)
The Technical Library of Tammersfors (TTKK)
The Technical Libray of Villmanstrand (LTKK)

Name of data base	Coverage	Period covered	Number of records August 1986
SMOT	Scandinavian catalogue of monographs within science and technology comprising monographs, conference proceedings, dissertations and separately catalogued single issues/volumes of serials accessioned by DTB, KTHB (Stockholm), CTHB (Göteborg), Ae (Studsvik), NTUB (Trondheim), TKK (Helsinki).	DTB publ.year 1968- KTHB ca. 1974- CTHB ca. 1974- Ae ca. 1974- NTUB ca. 1980- TKK ca. 1980-	258.000
MONO	Subset of the SMOT data base comprising publications owned by DTB.		123.000
[illegible]	Subset of the SMOT data base comprising publications not owned by DTB, but held by one or more of the other Scandinavian technological libraries.		135.000
PERI	Holdings catalogue of serials and annual publications of DTB, merged with the catalogue Danish List-Tech (current titles within science and technology held by about 70 Danish technological libraries). Furthermore, serials holdings catalogue of TKK (Helsinki), LTKK (Villmanstrand) and TTKK (Tammerfors). Serial holdings catalogues of NTUB, KTHB, CTHB and Ae, incl. library codes from the Swedish List-Tech are under process of being merged into the PERI data base.	DTB TKK LTKK TTKK } total holdings	29.000
SPOT	Scandinavian catalogue of periodicals within science and technology, consisting of the PERI data base, and temporarily two data bases KTHP and NTHP comprising serials in the Swedish technological libraries (KTHB, CTHB and Ae incl. library codes from the Swedish List-Tech) and in NTUB.		60.000
ALIS	Logical sum of MONO + PERI data bases.		152.000
DTHM	Containing monographs held by some institutional libraries of the Technological University of Denmark (DTH): AMT, STA.		10.000
INGE	Selected papers from the weekly magazine "Ingeniøren".	1980-	3.200
RAPP	NTIS reports accessioned by DTB.	1981-	2.300
EMNE	Local UDC subject headings list used for classification by DTB.		2.300
DVJB	Monographs, dissertations, conference proceedings, scientific reports held by the Danish Veterinary and Agricultural Library. The period 1979-82 is only partly covered; as from 1983 all publications are included in the system.	1979-	10.700
UBTO	Logical sum of the UBMO-, UBIN- and UBPE-data bases.		40.000
UBMO	Monographs within science and medicine held by the Copenhagen University Library, 2nd dept.	1979-	21.000
UBIN	Monographs within science and medicine held by the Copenhagen University institutional libraries.	1979-	7.000
UBPE	Current serials held by the Copenhagen University Library, 2nd dept.		12.000

Fig. 5. ALIS databases

Norway:	The Norwegian Technological University Library (NTUB)
Sweden:	The Royal Institute of Technology Library (KTHB) The Chalmers Technological University Library (Z) The Studsvik Energy Technology Library (Ae)

Of course, there is an overlap especially in the holdings of the central libraries of technology of the four Scandinavian countries. Regarding the two main bases SMOT (Scandinavian catalogue of Monographs On Technology) and SPOT (Scandinavian catalogue of Periodicals On Technology) duplicate records have been eliminated as far as possible. The monographic records have been merged using ISBN as identification. The serials records have been merged using 1) ISSN, 2) CODEN and 3) the titles as identifying sort criteria, in all cases a positive hit is checked visually.

The SPOT base is one physical database, whereas the SMOT base is a logical database consisting of two physical bases: 1) a "MONO" base comprising all DTB-records, enriched with library codes from the other three countries, and 2) a "REST" base containing records of monographs
accessioned by a Finnish, Norwegian or Swedish library, but not matching any record of the MONO base.

Description of a record in the ALIS databases:

The following is a listing of all fields which may occur in records in the bibliographic databases:

LABEL:	CONTENT:
TI	Title
JT	Journal title

AU	Author
CC	Classification codes
CT	Controlled terms
UT	Uncontrolled terms
SB	ISBN (and ISSN)
CO	CODEN
DT	Document type, Publication year, Entry date, Title code à la PEKOS (ETH/Zürich) (for serials only, see ref. 4)
LA	Language
BD	Bibliographic description (not searchable)
LC	Library codes

Valued parameters:

PY	Publicaton year
ED	Computer entry date (YYMMDD)

Further explanation to the fields CC, DT, and LA:

CC: Classification codes
UDC (Universal decimal classification) or Dewey decimal classification or LC (Library of congress classification system)

DT: Document type
m=monographs, s=single issues of serial catalogued as a monograph, d=dissertation (UDC classified), e=dissertation (not classified), p=periodical

LA: Language
The following language codes are used in the ALIS databases:

afr	Afrikaans	lit	Lithuanian
alb	Albanian	dut	Dutch or Flemish
ara	Arabic	nor	Norwegian

Example of a record in the MONO database:

```
-- R  34/571 ------------m002350572
TI IEEE infocom;
   Infocom;
   Kongresser 1983;
   San Diego,Calif. 1983;
   Computers and communications integration, reality and illusion
AU Institute of electrical and electronics engineers,  Computer society;
   Institute of electrical and electronics engineers,  Communications
   society; IEEE communications society; IEEE computer society
CC UDK: 621.391  (06)  061.3;
   DOC: 621.3804301  001.64404;
   LCON: TK  5105  QA  76.9.  D5
SB 0818600063
DT m 002350572   1983  840720
LA eng
BD                               C 621.391(06) IEE
   IEEE infocom.
   1983 conf., San Diego,Calif. (Theme: Com-
   puters and communications integration - re-
   ality and illusion). (Sponsored by) IEEE
   computer society and IEEE communications
   society. Proceedings. Publ.by Institute of
   electrical and electronics engineers, IEEE.
   New York,N.Y. 1983. 17+618 s. (Med bibl.)           LB.NR: m002350572
   HAVES/AVAILABLE: DTB,TKK,NTH,KTHB,Z
LC DTB, TKK, NTH, KTHB, Z
```

Example of a record in the PERI database:

```
-- R 2/3 -----------------p010017580
TI        Spectrochimica acta.  Part A: Molecular spectroscopy
CC 535.3  (05)  (410)  539.19  543.42
SB 05848539
CO SAMCAS
DT p 010017580          810102
   Speact SaPA SaPAMs
LA eng
BD Spectrochimica acta.
   Part A: Molecular spectroscopy. Oxford.
   (Tidl.tit.: Spectrochimica acta)  0584-8539   SAMCAS
   C 23(1967)-
     sidste 12 mdrs.hft.udlånes ikke (Dok.afd.)
   BIBL.KODER FRA DANSK LIST-TECH 1983: OU T U2 Risø
LC DTB.
```

Standard formats for the ALIS databases:

F=1 CC,BD,CT,UT
F=2 BD
F=3 TI,JT
F=4 All fields
F=5 CC,BD

bul	Bulgarian	pol	Polish
dan	Danish	por	Portuguese
eng	English	rum	Roumanian
esp	Esperanto	rus	Russian
est	Estonian	lap	Lappish
fin	Finnish	scc	Serbo-Croatian, Cyrillic letters
fre	French	scr	Serbo-Croatian, Latin letters
far	Faroese	slo	Slovakian
gre	Greek, modern	slv	Slovenian
esk	Greenlandic	spa	Spanish
heb	Hebrew	swe	Swedish
hin	Hindi	cze	Czech
ice	Icelandic	tur	Turkish
ita	Italian	ger	German
jpn	Japanese	ukr	Ukrainian
chi	Chinese	hun	Hungarian
lat	Latin		

b) The "EMNE" database

The EMNE database is the UDC/subject headings list (in Danish) of DTB comprising an excerpt of the Universal Decimal Classification system adapted to the requirements of DTB.

The following fields may occur in records in the EMNE database:

LABEL:	CONTENT:
CT	Controlled term
UT	Uncrontrolled term
NO	Notes
BT	Broader term
RT	Related term
NT	Narrower term

Example of a record in the EMNE database (here translated into English):

```
---------R 1/1 --------664.2

CT  664.2            Starches. Potato Flour. Gluten
BT    664            Food industries
RT    664.002.4      Food Adjuncts §
      664.1          Sugar industry
      664.3          Edible and cooking fats and oils
      664.5          Spices and condiments
      664.6/.7       Baking and Milling
      664.7          Milling
      664.8          Preservation generally
      664.9          Preservation, animal produce
NT    664.292        Pectins
```

The standard formats for the EMNE database are:

F=1 CT, NO
F=2 CT
F=3 CT,NO
F=4 CT,NO,BT,RT,NT
F=5 CT,NO

DATA EXCHANGE WITH OTHER SYSTEMS

The catalogue databases in ALIS are updated in different ways. The catalogue records produced by DTB and some other Danish libraries are transmitted from the local computer installation to the catalogue database. From the other Scandinavian libraries records are received on magnetic tapes so far, produced by their local catalogue systems (BIBSYS in Norway, LIBRIS in Sweden and TENTTU in Finland). The database generation programme of ALIS is able to process both catalogue records in the different occurring MARC formats and records in the DTB-format (see ref 1).

USE OF THE ALIS DATABASES. USERS' INSTRUCTIONS

About 2600 institutions, firms, libraries, private persons etc. have a password to the catalogue search part of ALIS (since July 1986).

An important activity in running an online public access catalogue is the publishing and maintenance of a user manual. ALIS user manuals are published in three versions: 1) an exhaustive version describing in detail - with many examples - the use of all functions in the ALIS catalogue search system, 2) a mini guide for the more experienced users, describing the main functions only, and 3) a "micro" guide (70 x 120 mm card) showing only telephone and Datapak numbers and the more important command words with some few examples.

Even if an instructive users' guide exists, experience shows that the importance of instructional courses for the users - and the library staff - should not be underestimated. More than 1.000 ALIS users have attended one-day's ALIS courses held in DTB or in some of the other libraries taking part in the ALIS network.

The use of the search system is currently registered and amounts to about 40 hours connect time per day (1986). As there is a tradition that use of the catalogues of the Scandinavian libraries is free of charge, there is so far no membership fee or charge for making searches and online document ordering in the ALIS databases.

FUTURE PLANS

The next step in the development of ALIS to a totally integrated library information system is the mechanization of the acquisitions and budget control system of DTB.

As regards the search part of ALIS it should be mentioned, that the establishment of a database comprising a joint Scandinavian four-language abridged UDC table is under consideration.

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4) Nöthiger, R.: PEKOS - The Automated periodical-control system of the ETH-Bibliothek, Zürich. IATUL Proceedings 12 (1980): pp. 69-81.

CURRENT AND FUTURE FORMS OF INFORMATION RETRIEVAL AS PROVIDED BY UNIVERSITY MICROFILMS INTERNATIONAL

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Information Publications International Ltd.
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CURRENT AND FUTURE FORMS OF INFORMATION RETRIEVAL AS PROVIDED BY UNIVERSITY MICROFILMS INTERNATIONAL

Susan Orchard

Information Publications International Ltd.

The talk will start by giving the historical background of University Microfilms International and then go on to describe current information storage and retrieval systems for dissertations and periodicals. There will be a videotape presentation of UMI's information delivery workstation followed by a discussion of discs versus microforms as future storage media.

CURRENT AND FUTURE FORMS OF INFORMATION RETRIEVAL AS PROVIDED BY UNIVERSITY MICROFILMS INTERNATIONAL

Information Publications International, a company which represents the publishers shown on this list. (See Appendix 1)

Most of the companies shown here are traditional publishers. As the theme of this symposium is New Information Technology, I would like to concentrate on talking about just one of these companies: University Microfilms International or UMI, based in Ann Arbor, Michigan, whose aim has always been to be at the forefront of new technology. I will be discussing UMI's experiments with electronic publishing on optical and compact disk and how we see this form of information storage and retrieval developing in the near future.

But first I would like to start by outlining briefly the origins of UMI. Many people still think of microfilm as a relatively new method for storing and publishing information. You might therefore be surprised to learn that UMI was founded in 1938, nearly 50 years ago, by an American publisher, Eugene B. Power, who wished to make available research monographs which, because of their highly specialised nature, could not be published as books in the number of copies required to make printing commercially viable. He therefore began to publish these monographs on microfilm. His first major project was to put a camera in the British Library to film the old and rare books, which were stored there. Since that time, UMI has expanded considerably and it is now the biggest commercial publisher of microforms in the world - only the Library of Congress in Washington produces more. However, the name University Microfilms is actually somewhat misleading nowadays - we do not supply information only to University Libraries and we do not supply it only on microfilm. Every year we take in many thousands of items of published and unpublished information - books, periodicals, newspapers, theses, reports and so on - and make these easily available to our customers in microformat (film and/or fiche) and often on paper as well. In addition, where the information is not already indexed or abstracted, we often do this ourselves and make this bibliographic data available in microform, on paper, or, in addition, electronically.

Paper has been the traditional medium for providing the indexes and bibliographies which are so vital in locating the information required. Newspaper indexes such as the one for the New York Times produced by UMI are indispensible in locating the items of interest. Such indexes and bibliographies have also been available for many years now either exclusively or additionally in microform, mainly microfiche,

The benefits of microforms in terms of cost and particularly space savings are obvious. Let me take as an example UMI's Comprehensive Dissertation Index. The CDI Mainset covers the years 1861-1972 (i.e. well over a century) and contains bibliographic information on the 417.000 theses written and accepted at North American Universities during this period. It is available in paper form in 37 volumes. We then published a Cumulation covering a mere 10 year period, 1973-1982, which is available on paper in 38 volumes and contains bibliographic citations for the 350.000 theses accepted during this time. This Cumulation is also available on a mere 394 fiche at a reduced price. It is obvious how much space can therefore be saved by using microforms and this is a very convenient and compact way of coping with the information explosion which has hit libraries in the last 10-20 years.

Microform Technology also allows us to store the 900.000 theses which we currently hold and the approx. 30.000 new titles which we receive each year, and to easily make copies to customer requests. This makes it possible for us to "publish" a dissertation of which we might never sell a single copy - though naturally we are delighted if it becomes a best seller and we sell 5 or more copies.

I mentioned earlier our Comprehensive Dissertation Index. We publish an Annual Supplement to this in the November of the following year. However, people often need to have information on the latest research in their subject area more quickly than this and so we publish a monthly abstracts journal, Dissertation Abstracts International. This is available on paper, in microform and additionally, through online searching. The complete Comprehensive Dissertation Index is available for searching online through DIALOG's file 35 with author-written abstracts also available online for titles taken into the programme since March 1981. A dissertation can be located by key-words in the abstract as well as in the title. Our customers can therefore either search the database themselves or ask us to provide them with custom-built profile searches. Full-text copies of dissertations may also be ordered online.

In addition, we are now pleased to announce our first CDROM database product, Dissertation Abstracts Ondisc. A demonstration disc, soon to be installed in selected library test sites, includes database information from 1984 and 1985. The completed product, scheduled for introduction in late 1986, will feature two discs covering the entire database of nearly 900.000

citations to doctoral dissertations and over 200.000 recent abstracts.

Dissertation Abstracts Ondisc can be searched by keyword (appearing in the title and/or abstract), author, title, publication year, and degree-granting university. A combination of function keys and on-screen prompts provides a simple yet powerful user interface.

The UMI dissertation database is one of the largest and most widely used bibliographic information files in the world, and the only central source for accessing almost every doctoral dissertation accepted in North America since 1861. Approximately 2.500 new citations are entered into the database each month.

The introduction of Dissertation Abstracts Ondisc is part of a major development effort at UMI, marking the company's commitment to new CDROM and electronic information products which complement its present offerings on microfilm, paper, and online.

Final product information - - including frequency of updates, required software and related equipment, and pricing - - will be released during autumn 1986.

I would like to leave dissertation products now and go on to another area where UMI is heavily involved in developing electronic information products. Again, I feel it would be useful to give an overview of our current activities before going on to describe our future plans and products.

Our Serials in Microform publishing programme offers the largest and most comprehensive collection of periodicals, journals and other serial literature available anywhere in the world. This collection now contains more than 14.000 serial titles, over 9.000 of which are currently being published, and new titles are being added constantly. The collection has grown steadily since its inception in the early 1940's, to meet the demands of general and specialised libraries, as well as professional and academic researchers at all levels and in all fields. For almost all the titles which we store on microfilm, we offer customers a choice of formats: 35 mm microfilm; 16 mm microfilm, which is often sold in a cartridge, and microfiche. The space-saving aspect of microforms has been touched on earlier. Other costs such as binding costs and the cost of replacing missing issues before binding can take place, can be reduced or eliminated by the use of microforms.

However, if you need a replacement issue of a journal before the microform is available, or if you urgently need an article from a journal which is not held by your library, you need to find other sources for obtaining these items.

Through its Article Clearinghouse, UMI can offer subscribers copies of articles from more than 9.000 periodicals. A customer can search UMI's catalogue of available titles using DIALOG or BRS for example and then place an order electronically. The core collection for this service dates from 1978 and orders from within the United States are processed and shipped within 48 hours. Unlike most other suppliers of article copies, UMI has licensing agreements with more than 4.000 publishers, thus guaranteeing copyright clearance. The electronic storage of information about which journal articles are ordered facilitates the payment of royalties.

UMI's parent organization, the Bell & Howell Company, has just announced its purchase of Data Courier Inc., an electronic business information database company located in Louisville, Kentucky. Data Courier is now an operating unit of UMI.

Data Courier produces five business information databases including ABI/INFORM, which consists of article abstracts gleaned from more than 660 U.S. and foreign publications. ABI/INFORM is the oldest and largest business information database available worldwide and can be accessed through twelve online systems, among them BRS and DIALOG. Through its Article Delivery Service, Data Courier offers photocopies of most of the articles abstracted in ABI/INFORM. Data Courier and the UMI Article Clearinghouse staff will now be working together to offer the customers of both document delivery services expanded access to article copies.

I would now like to turn to UMI's prototype system for electronic information delivery. The Information Delivery Module or IDM is designed to support local and remote document retrieval on a microcomputer, and to integrate information searching, ordering and delivery.

Developed to support journal search and retrieval activities from one workstation, the IDM was first demonstrated at the International Federation of Library Associations and Institutions (IFLA) conference in Chicago in August 1985. A videotape presentation, which you will see shortly, featured:

- access to distributed databases of journal articles and related indexes on optical disc;

- access to remote (online) databases, coupled with electronic or postal article delivery.

The IDM prototype is made up primarily of off-the-shelf hardware, integrated with the OCLC (Online Computer Library Center) M300 workstation or an IBM-compatible PC. The IDM adds the following document retrieval capabilities to existing microcomputer workstations:

-1 an optical disc storage module for storing large alphanumeric and image databases;

-2 database retrieval software for searching databases stored on optical disc;

-3 a facsimile interface to receive documents from a remote information source via telefacsimile;

-4 a desk-top electronic printer for printing documents retrieved from optical disc or transmitted from a remote source.

The workstation therefore includes two subsystems: one for receiving, forwarding and printing digitally transmitted images; and the other for retrieving, displaying, and printing documents and data stored on optical disc.

The idea is to apply new technology in a way that optimizes the return on investments that the market has already made in microcomputer equipment and systems. It all adds up to a single integrated workstation, made up of standard, general-purpose equipment, through which a user can search for, order and take delivery of documents.

UMi contracted with Time Management Software, Inc. (TMS) to perform key tasks associated with integrating the IDM's optical-disc subsystem and databases. TMS is a company specializing in microcomputer-based storage and retrieval systems for optical discs.

UMI, in co-operation with the Institute of Electrical and Electronics Engineers (IEEE) and the Institution of Electrical Engineers (the original providers of the information), asked TMS to integrate the Local Information Delivery Subsystem. The Local Subsystem uses optical media, videodisc or CD/ROM, to store distributed databases of high-use documents for optimum economy, speed and convenience of access.

The demonstration videodisc database shown at IFLA consisted of digital facsimiles of the 1984 issues of 42 IEEE journals, combined with an index extracted from the INSPEC database. The user can electronically search the index, and retrieve and print cited articles in their entirety.

The Remote Information Delivery Subsystem allows the user to search an online index and order cited articles (that are not in the optical-disc database) over various online systems or networks, including the OCLC ILL Subsystem.

UMI also demonstrated a database consisting of its own Dissertation Abstracts International and Comprehensive Dissertation Index and containing more than 650.000 titles (880 megabytes) on a single 12-inch optical disc.

Users can conduct keyword searches on both the abstracts and the index, or browse through the abstracts. Through the Remote Delivery Subsystem, they can then order cited titles from UMI over an online network. UMI is working closely with OCLC on the development of the IDM, especially with regard to network telecommunications access.

After evaluating several retrieval packages, UMI selected TMS's Electronic Research Software, which affords user-friendly keyword searching as well as sophisticated Boolean searching. It also lets untrained users search a database with techniques they commonly use to search books and other print media. Its unique features include electronic "bookmark" and "notepad" capabilities for selected information.

The IDM system, as it is now conceived, will allow access to distributed databases of journal articles and related indexes on optical discs and access to remote (online) databases, coupled with electronic or postal article delivery.

A unique feature of the IDM designed into the system will allow UMI to track billing and royalty data in connection with the printing of copyrighted documents and data. UMI expects to charge for each use of an article as it is printed from the optical disc. Approximately once a month, UMI will poll all IDM workstations for transactional data on the printouts and for billing purposes.

UMI believes that as a result of this billing feature, the IDM will become a true "information vending machine". It is planning to price article printouts in such a way that they will be competitive with the cost of library photocopying services.

UMI is now in the process of field testing the prototype IDM, and expects to offer it to support the electronic distribution of the Company's future information products and services. The final selection of features and performance specifications will be based on feedback from user studies.

I would now like to show you a videotape presentation of the IDM. (For transcription see Appendix II)

To summarise:

The IDM workstation can do lookups and transactions; can link database records, systems and suppliers; can receive documents (including pictures and text) transmitted over dialup phone systems and networks; and can display and print delivered information in both ASCII (American Standard Code of the American Information Interchange) and image form.

In short, it provides the user with a single point of access to search, order and retrieve information supplied from various local and remote sources.

Here's how it might work for you. (Appendix III, Slide 1)

Imagine yourself using the IDM workstation shown in the attached diagram. The box around the IDM represents your library, with holdings on paper, film and optical disc.

You've just completed a remote online search resulting in six bibliographic citations, and you would like to retrieve the cited articles. Because your library's serials holdings have been loaded into the IDM, it matches your retrieved citations (by ISSN and Coden) with local holdings information.

The IDM finds two of the articles in the optical disc database, points to another held in the library's hardcopy stacks, and to a fourth held on microfilm. Four of the six articles are available in-house, two instantly as printouts from the optical disc.

A search on your bibliographic utility reveals that UMI can supply the fifth article, but not the sixth; so, using the utility's ILL function, you ask UMI to transmit the article to your IDM overnight (to take advantage of the low nighttime phone rates or nighttime use of a network).

You could have had UMI electronically transfer your request for the sixth article to a backup vendor, or you can request it via ILL from a nearby library.

You also could have forwarded the transmitted and optically-stored articles electronically to someone else's fax machine or IDM, had you wished to.

You were able to do all this at one time, in one place, without paperwork or wasted time and effort.

FUTURE IDM DEVELOPMENTS

UMI introduced the first IDM prototype in August 1985. Since then, the IDM has been demonstrated and presented to hundreds of groups and individuals in the U.S.A., eliciting very favourable responses.

We wish we could begin filling the many requests received to date for IDM trial units. But we're not quite ready.

We are, however, planning to develop three versions of the IDM for phased introduction in the coming year.

* THE IDM 100: ASCII DATABASE MODULE -- a simple CDROM player and PC interface to support ASCII (i.e. Text) searching of ondisc databases;

* THE IDM 200: IMAGE DATABASE MODULE -- adds a

desktop electronic printer and image-processing capabilities to the IDM 100, allowing images to be zoomed and scrolled on low-resolution displays, as well as printed out at a resolution of 300 spi;

* THE IDM 300: REMOTE ACCESS MODULE -- adds communications and telefacsimile (Groups 3 and 4) capabilities to the IDM 200, permitting the buffering, forwarding and printing of transmitted documents.

In addition to the IDM, which is meant to plug into your PC, we are working on the design of a fully integrated workstation for the future.

IDM PRICING

Pricing is still a speculative issue. But I will say this: we very much want the price of single-CDROM versions of the IDM 100 to be under $ 1.000, and expect fully-configured IDM 300s -- with the electronic printer and all the optional extras (including a high-resolution display) -- to be under $ 12.000. That's the range we're shooting for; many of you will undoubtedly want something in the middle.

Finally, what are the prospects of the optical disc replacing microfilm for library storage of periodicals? (Appendix III, Slide 2)

Periodicals will soon become available to libraries on optical disc, affording improved access to articles. However, optical discs will not replace the microfilm holdings already in libraries; nor are they soon likely to replace film as a library preservation medium; nor will they soon afford the breadth of title coverage presently available on film.

Technical, legal and economic constraints obstruct full scale electronic conversion of periodical literature. Consequently, periodicals on disc will co-exist with serials on microfilm in most libraries for years to come. (Appendix III, Slide 3)

Even if there were no technical issues, the two media would have to co-exist for practical reasons. The financial investment in the retrospective conversion of periodicals to disc would be prohibitive in relation to the benefits; and libraries could not afford to replace their past investments in film conversion with new and larger investments in disc conversion. Moreover, it would take many years for the industry to sort out all of the proprietary rights that obstruct mass retrospective conversion.

Therefore, libraries and micropublishers must continue to support their past investments in film and film systems -- though not to the mutual exclusion of investments on other media. (Appendix III, Slide 4)

In considering the future prospects of periodicals on disc versus film, librarians must understand the important differences and strengths of the two media. They must also have a clear sense of their libraries' respective missions and objectives.

If my mission, as librarian, were to acquire complete and accurate page-images of the historical record, the optical disc (in the supportable forms and formats presently planned for it) would not offer me what I now require of film.

However, if one of my aims were to provide fast, selective access to periodical articles, with relatively little concern for archival quality, then film would not offer me what I would expect of a disc.

If both of these needs (archival preservation and selective access) must be met, I might then wish to use both media.

The disc-versus-film debate is analogous to the radio-versus-Television debate in years past. TV ultimately displaced a certain amount of radio. But it also gave radio new life by focusing radio on what it does best. The two now complement each other, as can film and disc.

Electronic storage and communications systems such as the IDM will prove to be very powerful tools when used correctly for the things at which they function best, but they will not replace existing services, merely find their own niche alongside everything else.

APPENDIX I

Companies represented by

INFORMATION PUBLICATIONS INTERNATIONAL

272

252

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Information Publications International

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INFORMATION PUBLICATIONS INTERNATIONAL
The following companies are represented on our stand

UMI - UNIVERSITY MICROFILMS INTERNATIONAL

BRITS - BRITISH THESES SERVICE

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GOWER PUBLISHING COMPANY

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UMI RESEARCH PRESS

WESTVIEW PRESS

LIBRARIES UNLIMITED

TRANSNATIONAL BOOKS

WHO'S WHO: INTERNATIONAL

EDITIONS DELTA

KEMPS

HERO BOOKS

SEVEN LOCKS PRESS

PROBUS BOOKS

BUCH. VEREINIGUNG

EDITRICE BIBLIOGRAPHICA

ART ADDRESS

Information Publications International Ltd
Registered in England: Number 1677919 Registered Office: Summit House, 170 Finchley Road, London NW3 6BP

APPENDIX II

Transcription of the videotape presentation of

THE INFORMATION DELIVERY WORKSTATION

UMI'S Integrated Library System

for

Electronic Document Delivery

NARRATOR

"Access"

The word has become synonymous with "computers".

Fast, comprehensive, convenient, information search and retrieval.

Until now, however, computerized access to journals and technical literature has been limited mainly to bibliographic information.

Search and retrieval of citations that point to documents.

Retrieval of the documents themselves has remained a laborious process.

Someone still has to physically get the documents, copy them, return the originals, and deliver the copies.

A process that takes time, effort and expense.

Computerized document retrieval promises to change all that.

And computer workstations in libraries, along with the advent of laser disk technology, are making this change possible.

Nick Alter, UMI's vice president of electronic publishing, explains.

NICK ALTER (UMI'S VICE PRESIDENT FOR PRODUCT DEVELOPMENT) INTERVIEW CLIP

We believe the development of an information delivery workstation is going to change expectations and requirements for document delivery in the future.

Today, at UMI, we use the postal system to deliver documents to our customers. But soon, we will be transmitting documents as well, and dispensing copies of documents from point-of-purchase systems in libraries.

Now, to do all this, we will first convert documents from paper to electronic form. But then we convert them back to paper form -- as facsimile reprints -- for final distribution to the customer.

Paper continues to be the market's preference for end use, although electronic delivery is emerging as a faster and, in some instances, cheaper alternative to postal delivery.

NARRATOR

The Information Delivery Workstation is designed around the IBM PC.

One of the most popular microcomputers in libraries, as evidenced by the number of library networks and groups already using it.

It does everything a personal computer normally does. Word processing. Spread sheets. Mailing lists. Electronic mail. And so on.

As librarians and information managers have sought ways to improve access, microcomputers in libraries have taken on the functions of full-fledged workstation.

Consider the OCLC M300 Workstation.

It's basically an IBM PC: a good general-purpose computer.

But it's more than a PC, because of what OCLC has added to it.

With the M300, a librarian can also search and retrieve records from OCLC's online catalogue, locate the holdings of other libraries, and transact loans and acquisitions with borrowers, lenders and vendors.

OCLC has added essentially three important capabilities to the IBM PC. A bibliographic capability. A transactional capability. And a communications capability.

These have greatly expedited the searching and ordering functions.

But the easier it has become for users to search for and locate documents, the more stringent have become the requirements for document delivery.

Building on what IBM and OCLC have done, UMI has added new capabilities to expedite the delivery function.

UMI presents the M300 Information Delivery Module, or IDM: designed to retrieve documents electronically for primary output on paper.

NICK ALTER INTERVIEW CLIP

When we talk about "information delivery", we mean the coupling of the searching and ordering functions with the delivery function.

And when we talk about the Information Delivery Module, we mean something that integrates these three functions electronically.

The IDM is designed to provide fast, economical, reliable document retrieval... and also, to facilitate copyright compliance.

NARRATOR

The IDM has two subsystems:
one for remote database access, for electronically retrieving documents stored off-site;

the other for local database access, for retrieving documents stored electronically in-house.

Both subsystems are supported by the same output printing options: a digital fax machine or an electronic printer, both requiring a ten-megabyte hard disk drive.

The hardware is all standard equipment, although UMI has added some special capabilities to the printer, plus some software and circuit boards to the PC.

The special capabilities added by UMI enable the workstation to perform as a receiver/printer, in conformance with international standards for digital telefacsimile.

In addition to being standard equipment, the fax machine and the receiver/printer are both general-purpose machines that can print either ASCII characters or facsimile images.

The main advantage of the receiver/printer is that it uses plain paper -- unlike most fax machines. which use hard-to-handle thermal paper.

The main advantage of the fax machine is its ability to function as a freestanding transceiver.

In either case, documents are received and stored temporarily in the hard disk, for forwarding to another location or for printing on demand.

What do we have so far?

We have a basic IBM PC.

We have the searching, ordering and communication capabilities that OCLC has added.

And we have the storing, forwarding and printing capabilities that UMI has added.

It all adds up to a single integrated workstation, made up of standard, general-purpose equipment, through which a librarian can search for, order and take delivery of documents.

Let's look at each of the IDM's subsystems.

First, the Remote Information Delivery Module, through which librarians can retrieve documents electronically from UMI's central store in Ann Arbor.

Now, let us turn to the other subsystem: the Local Information Delivery Module.

This subsystem is designed for point-of purchase delivery of high-use documents that require optimum economy, speed and convenience of access.

The idea, here, is to put UMI's store -- or, at last, core database from the store -- in the library, for on-demand printing and procurement of individual documents.

To support this kind of capability in libraries, UMI has added two distributed-database options to the M300/IDM: a videodisc system, and a compact-disc, or CD/ROM system. Let's look at the videodisc system first.

To demonstrate the videodisc system, UMI has teamed up with three other organizations:

> the Institute of Electrical and Electronics Engineers (I-Triple-E), publisher of leading technical journals and conference publications;
>
> the Institution of Electrical Engineers (in England), producer the INSPEC database;
>
> and, TMS, an Oklahoma company with expertise in micro-computer based optical-disk storage and retrieval systems.

The demonstration videodisc database consists of the 1984 issues of IEEE's journals, along with an index extracted from the INSPEC database.

As a standalone system, the user can search the index and automatically retrieve facsimiles of the cited articles for display and printout.

Alternatively, the user can....

search the complete INSPEC database through an online vendor,

retrieve the cited articles that are available in the local videodisc database,

and, over the OCLC ILL subsystem, request cited articles that are not in the local database.

Among the articles requested through ILL might be some that UMI could deliver over the OCLC network to the user's M300/IDM.

The M300/IDM would automatically log articles retrieved from the videodisc database, enabling UMI to electronically poll customer billing and royalty information.

NICK ALTER INTERVIEW CLIP

What this all means is that the user can have direct access to core literature held locally, as well as to supplementary holdings located elsewhere.

All through the same system, as if from the same place.

Our concept of "virtual holdings".

NARRATOR

Now let's look at the CD/ROM system.

It works essentially the same way as the videodisc system.

It's just smaller and more compact.

Thus, it is well suited for relatively compact databases.

A machine-readable bibliographic database is a good example; whereas a large document database of digital images might not be a good example.

To demonstrate the CD/ROM system, UMI has recorded its own database of Dissertation Abstracts International and the complete Comprehensive Dissertation Index (to more than 650.000 American dissertations) on a single compact disk.

Users can conduct keyword searches on both the abstracts and the index.

They can then order cited titles automatically from UMI over the OCLC ILL subsystem.

Let us again step back, and see what we have altogether.

We started with the IBM PC ... which, by the way, could also be an AT & T PC or some other IMB-compatible PC.

To the IBM PC, OCLC added capabilities for searching ordering and communicating over a dedicated network.

UMI added capabilities for storing, forwarding and printing documents transmitted over the OCLC network.

UMI then added capabilities for searching and acquiring article-facsimiles on demand from a point-of-purchase videodisc database.

Finally, UMI added the capability to perform free-text and controlled-index searches on CD/ROM and videodisc databases.

All this, in a single microcomputer workstation.

NICK ALTER INTERVIEW CLIP

There's an important historical link to what we're doing here.

Many librarians and publishers will recall a plan put forward by the Council on Library Resources, in 1978, for a National Periodicals Centre.

The NPC.

Whatever anyone may have thought of that plan, there is something about the NPC concept that touches on a solution to the complex issue of resource-sharing and document delivery.

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We invite your questions and comments for its introduction.

APPENDIX III

Slide 1: The IDM Concept

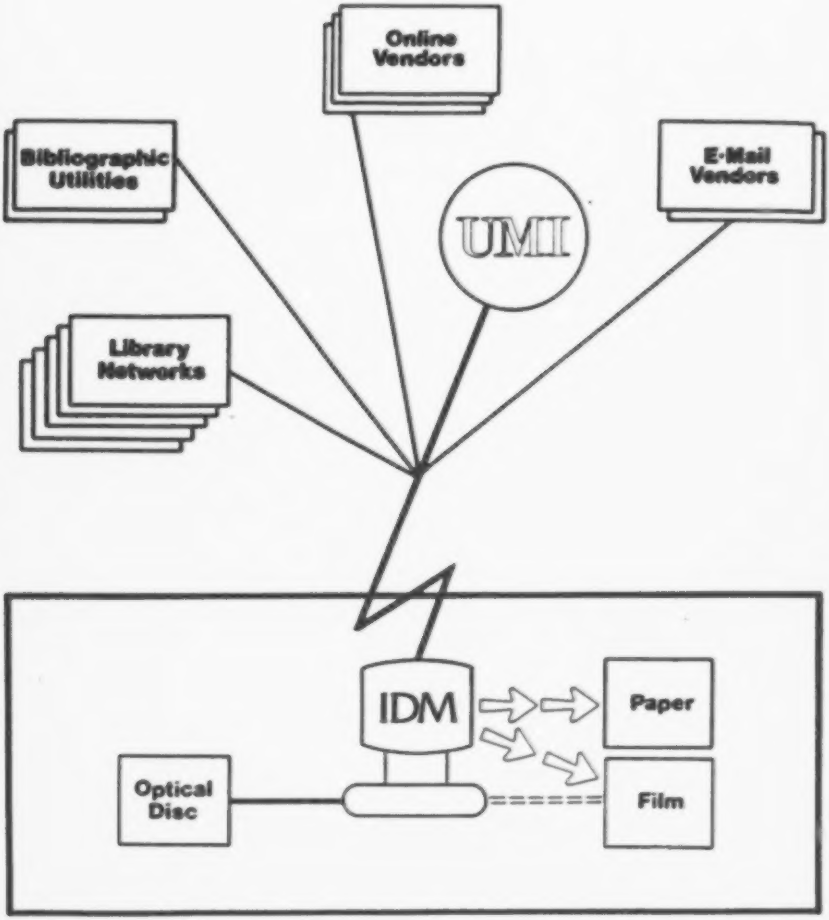
Slide 2: Journal Coverage Projections

Slide 3: Comparative Product Investment

Slide 4: Relative Utility

The IDM Concept

Single point of access



Online Vendors

Bibliographic Utilities

E-Mail Vendors

UMI

Library Networks

IDM

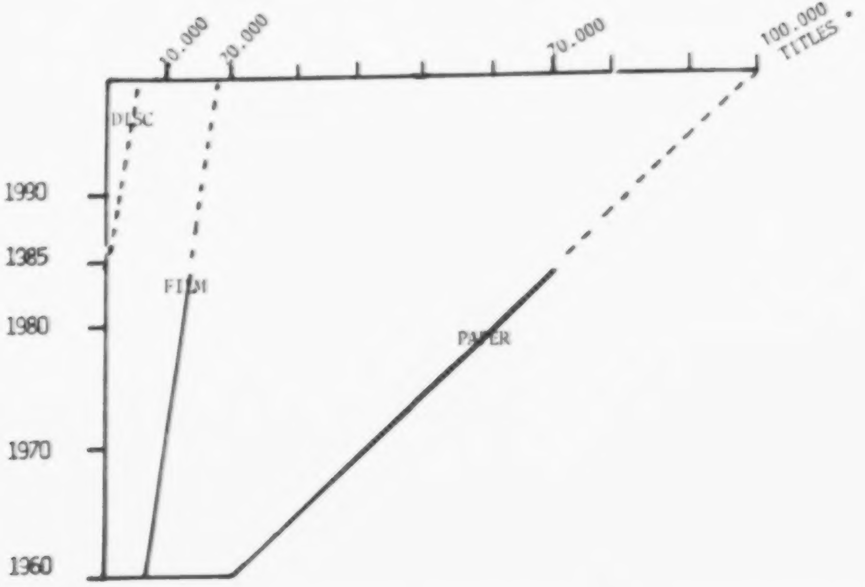
Paper

Film

Optical Disc

JOURNAL COVERAGE PROJECTIONS

PAPER versus FILM versus DISC



* Source: King Research Inc. Report on Scientific Journals in the United States: Their Production, Use and Economics. Published by Hutchinson Ross Inc.

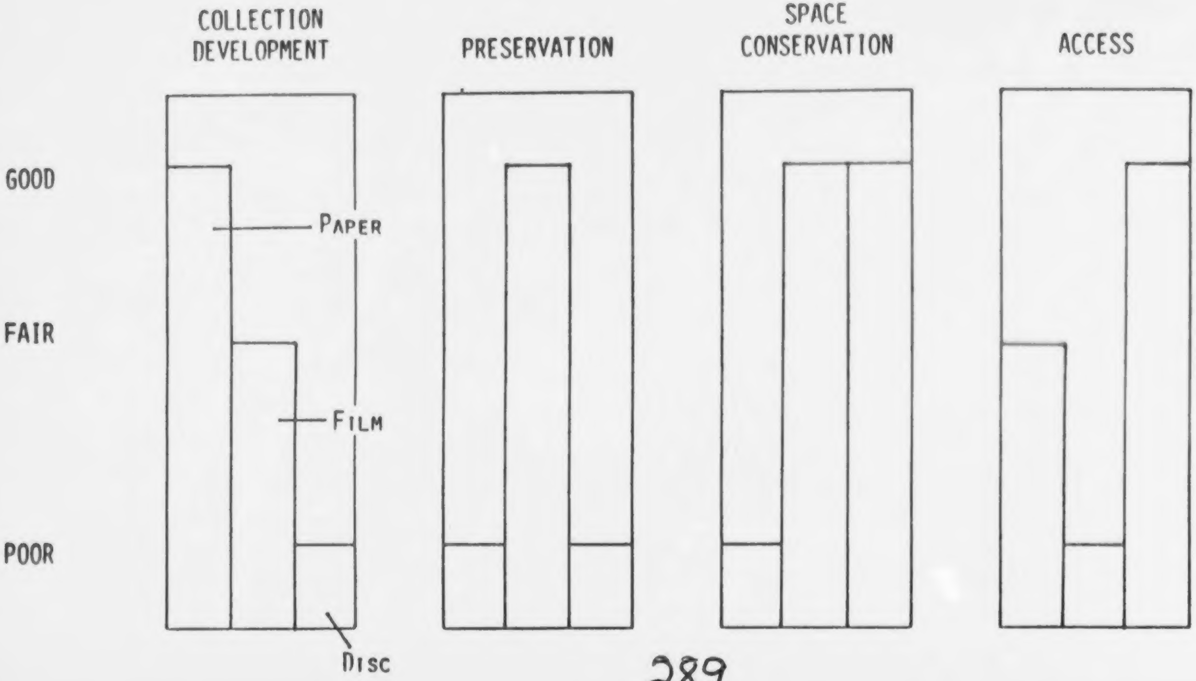
COMPARATIVE PRODUCT INVESTMENT

FILM VERSUS DISC

	1986		FUTURE	
	FILM	DISC	FILM	DISC
ORIGINAL FILMING/SCANNING	$1.00	$ 2.50	$1.00	$1.00
DATABASE PREPARATION		$ 3.00		$3.00
DISC MASTERING		$ 5.50		$3.00
TOTAL COST OF PRODUCT MASTERING	$1.00	$11.00	$1.00	$7.00

RELATIVE UTILITY

PAPER VERSUS FILM VERSUS DISC



Linking supra-local demands with local demands in the individual library's EDP planning

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Germany

Linking supra-local demands with local demands in the individual library's EDP planning

Hans-Albrecht Koch

The individual library's EDP planning is discussed with special reference to the following aspects:

- political conditions of planning with special respect to the federal structure of the FRG,
- impacts of the fact that library networks in the FRG are governmental institutions on the individual planning,
- impacts of the recommendations of the German Research Society on the planning decision,
- influence of the budgeting system (half-part support by the federal Government) on the planning autonomy,
- advantages and disadvantages of restricted competition in the field of EDP installations,
- foreseeable developments as, e.g., agreements on local and non-local modules of EDP in research libraries.

Linking supra-local demands with local demands in the individual library's EDP planning

The subject of this contribution is called "linking supra-local demands with local demands in the individual library's EDP planning", but should better be formulated "Linking local demands with supra-local ones", because, in general, libraries serve local users from their very local stocks at a range of more than 90 per cent, and in so far, university libraries first of all have local tasks and therefore local problems.

The formulation of the subject includes that there are local demands to be met and also supra-local ones, and includes also that there is a need of linking them, and suggests moreover, that the local library has, at least, a chance of EDP planning and linking both sorts of demands. Some of my colleagues perhaps would doubt that the individual library has such a chance. That they are only partially right, is what I am going to reflect.

Let us start with a comparison. You know the famous magic quadrangle of economics which means that a nation's welfare depends on achieving the following four aims at the same time: stability of prices, economic growth, full employment, and balanced trade exchange - these four aims always being in a strong conflict with each other. If, as a man of practice, you make people believe that you are fulfilling all of them at the same time, you have a good chance of being appointed minister of economic affairs of your country or even prime minister. If you deal with these problems from a theoretical point of view you have, at least, a good chance of winning the Nobel prize of economics at the beautiful home city of the chairman of this session.

As a librarian you have not only to handle a magic quadrangle but a magic multi-angle of conflicting aims, especially in the field of EDP. Let me give only some examples. You are looking for the best software which, of course, at the same time must be the cheapest one to be found. You are looking for a software most suitable to your hardware, which, of course, at the same time must be the most portable one. You are looking for an acquisitions management module, which, of course, at the same time must be part of an integrated library system as well as a stand-alone system etc. etc. (in order to stop before sunset). If you, as librarians try to make people believe that you take care of all these conflicting aims at the same time in a successful way, you have, in contrast to the politicians, only two chances - depending on where you live: either to get bad reputation with your colleagues and your patrons, e.g. in Germany, or to get rid of your job and to follow up the Peter principle, e.g. in the United States.

I am going to present and discuss the following items from a German point of view:

1. A list of local EDP demands respectively functions subdivided into
   - user-related demands
   - administrative demands

2. A list of supra-local demands

3. A bird's view on what has been achieved on the local respectively on the supra-local level (and what not)

4. The question in what way and how far the planning environment has implications on the realization

5. A survey of the new recommendations of the Library Committee of the Deutsche Forschungsgemeinschaft (German Research Society) which was published this spring and concerns future developments of networks including local area networks

6. Consequences of these recommendations for the individual library's EDP planning.

1. List of local functions

The following user-related functions are to be provided which, of course, are also of importance for the library administration:

- Information retrieval facilities
- On-line public access catalogue (OPAC) which many access points
- Circulation system.

From the administrator's point of view the following functions are to be added:

- Monographs acquisition
- Periodical and serials acquisition and management
- Cataloguing
- Binding administration
- Management data (statistics, budget administration).

It must be kept in mind that many of the functions mentioned should be connected with each other in the way of an integrated on-line library system and that moreover, some of the user related functions should be available within a university local area network. So, e.g. there should be connections respectively interfaces between the OPAC and the circulation system, or between the information retrieval facilities and the OPAC, or between the periodical management module and the binding administration module, or between the acquisitions module and the cataloguing one. So e.g. the OPAC and circulation module must be available within the university local network.

2. Supra-local demands

The supra-local demands can be described from different viewpoints. Firstly, with respect to the functions to be fulfilled for the individual libraries, the networks should provide as many good bibliographical data as possible, including, e.g., authority files, and should support the cataloguing work in the individual library. Secondly, the networks should provide union catalogue functions for the member libraries and improve the inter-library-loan service. Thirdly, the network centers are expected to take over processing of library data and the production of output forms of the catalogues or of other output forms of the local catalogues. Finally, the network centers are obliged or expected to unify and/or streamline the EDP planning of their members and to be ahead of the respective developments, may it be in the field of hardware acquisition or in the field of software development etc. Due to the last mentioned function, the network centers are interested in strong standards and uniformity, by which the local libraries sometimes feel overwhelmed and restricted in their own initiatives.

3. What has been achieved

What has been achieved in the about 65 research libraries in the Federal Republic of Germany within the last decade can only be reported in a very rough way. We always must be aware that there are a lot of differences from library to library and from network to network.

Let us first look at the local scene. One can say, that in most, but not in all university libraries information retrieval facilities can be found which allow access to the growing number of data bases around the world. In many libraries circulation systems are to be seen, in some cases with self-made software, in many cases bought from firms, which provided hardware and software. The systems differ in their device and in the framework of functions. They also differ with respect to their age, and in some libraries people want to pray that the machines will survive for the time they are still needed. Some of the circulation systems provide the possibility of combination with a short title catalogue (in some cases such short title catalogues are especially built up for the circulation system), other systems have not had this, but allow the combination with a catalogue module in future. The processing is sometimes done in the library itself, sometimes in university computer centers.

Till now there are only very small beginnings of OPAC facilities. Normally the catalogues are either still card catalogues or microfiche catalogues (as computer output). Where integrated on-line library systems are to be seen, they are very old-fashioned ones of the first generation. Some acquisition systems are under development as stand alone systems without any linking to the catalogue. Some comparatively old and comparatively unsatisfactory systems can be found for the handling of periodicals and serials.

In general, one can say, that there is still a lot of off-line-service, a lack of linking of functions within an on-line system and a lack of participation on local university networks which are already in use for other than library purposes. Microcomputer facilities are not used to the same extent as they are already used in other fields of information processing. New developments like CD-ROM, are beginning to be checked up for library management applications.

On the supra-regional level several regional networks based on various hardware and software are set up. These networks differ very much in device, in organization, and in the facilities, e.g. for producing catalogues for the participating libraries. They also differ, at least, in their short term goals, some of them being more orientated to union catalogue functions, some being more orientated to the cataloguing support. The big networks with a great number of participating libraries suffer from response time problems. There is still a lack of communication between the networks.

On the national level there are two networks running comparatively well, the one being the Zeitschriftendatenbank (periodicals union catalogue), providing half a million of titles of periodicals and serials, the other one being a machine readable union catalogue of the catalogue data of the newly founded university libraries which process their cataloguing by EDP. Both union catalogues on the national level are of great importance for the inter-library-loan-service.

4. Planning environment and its impact on the realization

First of all, there is to be mentioned that no German university library is as free as an American one setting up the goals of planning. The libraries, normally being financed by the State Governments via the universities, are bound to the political framework of EDP plans of their state authorities and to the budgeting decisions of the several State Parliaments which normally take place within the annual decision concerning the university budget. Reflecting the federal structure of the Federal Republic of Germany most of the states have built up regional library network centers according to the recommendations of the Deutsche Forschungsgemeinschaft (German Research Society) of 1980. Only a few small states do not form a library network center of their own. According to this regional concept the individual library is obliged to follow up the planning policy of the center. The EDP centers, in general, aim at fulfilling network tasks, as cataloguing, interlibrary-loan and are in so far comparable, but they differ as mentioned above very much in hardware and software equipment, services offered, priorities, etc. Nevertheless they are ahead of the planning and must restrict the individual library's planning autonomy, more or less strongly. To turn to my very question in what manner the individual library is affected by the political network concept of libraries. I should like to attract your attention to some differences especially between the situation in the United

States of America and the Federal Republic of Germany.

In the United States the network centers are joined by the individual libraries on their free decision in order to obtain services from the network for which the library has to pay. Payment is the backbone of the networks and the mechanism by which is achieved that the network services satisfy the library's demands. If a library feels unsatisfied it is free to cancel a network membership, according to the principle: who pays for the pipers can order the music. A Library is also free to join more than one network when it wishes to use the services of them. This includes that the single library is, always on the basis of payment regulations, also free to make use of either cataloguing facilities or inter-library-loan arrangements or of both, etc., in a single word to set up its own priorities within the participation in a network. The library, on the other hand, is responsible for a local EDP equipment being not only satisfactory for the local needs but also for the participation in the networks. The individual library as a rule makes the choice between commercially offered EDP systems and is responsible for making the right choice. So the world of libraries, networks and firms is mainly based on the principle of competition, competition between networks and competition between EDP firms, a situation that, of course, produces running improvement of services and systems and includes the quick detection of weaknesses. The open market of networks, firms and libraries, on the other hand, has produced a lack of uniformity, but, as far as one can see, the big problems, like linking of systems, will be solved within a reasonable time within the Linking Systems Project (LSP).

In the FRG there is no free choice of a network for the individual library. It cannot decide whether to take part in a network which is more a cataloguing network or in another one which is more like a union catalogue or in one that takes the problem of authority control very serious or in another one that does not. These decisions have already been taken within the political structure of the concept of networks by directing each library to its respective network. Moreover, there is only little possibility for the individual library to enforce its own local priorities within the priority list of the network. These priorities are fixed in the centers respectively the committees of the centers comprising of course, representatives of the participant libraries.

Even with respect to the local EDP infrastructure equipment the individual library has not at all full scope for the following reasons: all expensive EDP equipment in universities is based on a complicated system of fund raising procedure. In a first stage the state authority parliament has to provide the money within in the annual budget decision; in a second stage an application must be directed to the federal government that grants 50 per cent of the costs, but only after the agreement of the Wissenschaftsrat (Research Council) which asks the Deutsche Forschungsgemeinschaft for a vote. Obviously this is not only a time-consuming procedure but also a difficult task for the library and any potential vendor who cannot contract before g passed the several decision-making bodies. Because the most decisive vote lies with the Deutsche Forschungsgemeinschaft (DFG), the library tries to anticipate the DFG decision principles in the application and to follow the respective philosophy which, of course, is not unchangeable. For example,

for a long period the DFG has asked for portable software in any case so that, as a result, turnkey system vendors offering strictly combined hard- and software of the same firm have had no chance on the German market.
(Recent decisions in this field have shown some Change.) Another criterion for the DFG has been the question whether a system applied for has been previously approved somewhere else in the Federal Republic of Germany. Moreover there was a period during which the governmental policy of subventions for home-made products was to be respected by the applicants and by the decision makers, a policy that had major influence in the fields of information retrieval facilities and of circulation systems. This, for some years, has produced a policy of more uniformity than was functionally necessary and has closed the German market for world-wide approved systems which, e.g., might have been cheaper than home made ones. Of course, the problem of adaptation of EDP systems deviced for English speaking countries to the German library needs has been taken care off by the international firms. (It can be noted that in 1987 for the first time there will be cooperation in this field between OCLC and the Deutsches Bibliotheksinstitut.)

In general, as a result of the planning environment in the Federal Republic of Germany one can say that, in comparison to the United States, we have,

- less experiments,
- therefore less misfortune, but also less experience (not only with respect to libraries, but also with respect to firms),

- a lack of internationality,
- less cost-benefit-awareness, and
- more uniformity, but within it nevertheless a great deal of variety.

5. Recommendations of the Deutsche Forschungsgemeinschaft of 1986

The Recommendations of the German Research Society of 1986 concern further development of networks including local area networks. These new recommendations seem to be very important. They deal with the following:

- Strict definitions of the three levels of local, regional and supra-regional EDP applications and of the tasks of these three levels as an interdependent functional system with interfaces

- For the local level there is recommended to build up a library system within a local respectively university network, comprising an OPAC and local subsystems concerning circulation, acquisition and periodicals management. For the regional level it is recommended to extend the regional network as resources of data for the cataloguing of monographs and for directing of inter-library-loan requests. For the supraregional level it is recommended to maintain the Zeitschriftendatenbank as resources for the cataloguing of periodicals and for directing the inter-library-loan requests. Also on the supra-regional level there should be the resources for the retrospective cataloguing.

For the respective levels interfaces to public networks or to other library networks are recommended.

- The recommendations stress the need of standards, as well of library standards as of technical ones. Library standards, e.g., are the "Gemeinsame Körperschaftsdatei (GKD)" (common corporate authority file), the Zeitschriftendatenbank with respect to the titles of periodicals and the data base of subjecthadings at the Deutsche Bibliothek that follows the new German cataloguing rules for subjectheadings (Regeln für den Schlagwortkatalog, RSWK).

  Technical standards concern the character set according the prescripts of DIN and ISO and the codes according DIN and EBCDIC, and for the exchange format MAB 1 as the national exchange format and MARC and UNIMAC as international exchange formats.

- The recommendations also stress for the first time the importance of local area networks, especially with respect to the structure of university libraries with central and departmental respectively institute libraries.

  The recommendations propose to allocate funds for a sufficient local EDP equipment for the individual library to take part in the three-levelsystem. The recommendations also take into account the flexibility of the terminal equipment of the local equipment.

- The recommendations are right to underline the importance of the forthcoming standards for network communication according to the model of ISO/CCITT and the gatewayproblems for the communication of the local library system with the library networks on the regional and the supraregional level, with the local university network and public networks.

6. Consequences of the recommendations

The recommendations mentioned are going to finish the debate of centralism or decentralism in library EDP planning by presenting clear definitions of the aims of the several levels, clear definitions for the interfaces and clear criteria and checklists for the local and supralocal planning. With respect to the fundamental role of the Deutsche Forschungsgemeinschaft the recommendations can be expected to be realized within a reasonable time.

The the following consequences of these recommendations can be seen:

- The responsibility of the individual library must and will grow for the local EDP planning.
- The clear definition of the role of the network centers confining them to what is really needed, namely the administration of big data bases and union catalogue functions, will streamline the cooperation between the local library and the network.
- Because the recommendations direct more to aims than to means there might be a better chance for the individual library for a free choice of systems, under the restriction, of course, that the given criteria and checklists will be

fulfilled by the chosen system, which can be said about many systems approved on the market, at least abroad.

- This will improve competition between the firms and as a result, will improve the EDP development itself.

One must see, in how far new possibilities of storage and distribution of data, as CD-ROM, will affect the methods of retrospective cataloguing. It might be that the retrospective cataloguing, by means of CD-ROM, will return from the third level to the local, in terms of the recommendations.

In general, it seems to me that - in the words of our host - we can move a little bit from reading reports to making use of them. Especially the way seems to be paved for some better cooperation between firms and libraries - which has been one of the main goals of the Essen symposia from the very beginning.

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BIS-4 Ausleihsystem
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